CQ

Why use f.m. ?

Which is better: f.m. or s.s.b ?

What is wide-band f.m. ?

75¢ February 1971

What is phase modulation ?

What is slope detection ?

What is frequency deviation ?

What range can I expect ?

How much power do I need ?

What is a repeater ?

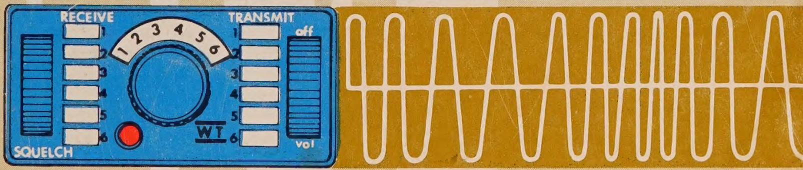
Why use crystal control ?

Is frequency stability important ?

How can I use my present equipment ?

Can I copy f.m. on my s.s.b. transceiver ?

FM SPECIAL PART 1



What frequencies are popular ?

What is tone burst encoding ?

The Radio Amateur's Journal

better than the "Hot-Water 100" ...and a nickel cheaper

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NEW Heathkit® HW-101... $249.95*

World's best low cost rig is now even better. The Hams at Heath have done it again . . . by adding important new performance features to the famous HW-100 . . . without adding to the price. That's Heathkit value . . . and this is the rig . . .

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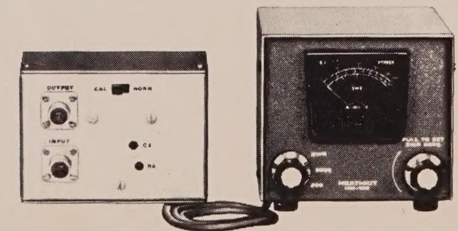
Kit HW-101, 23 lbs.	**$249.95***
Kit HP-23A, AC supply, 19 lbs.	**$51.95***
Kit HP-13A, DC supply, 7 lbs.	**$69.95***
SBA-301-2, 400 Hz CW filter, 1 lb.	**$21.95***
SBA-100-1, mobile mount, 6 lbs.	**$14.95***

HW-101 SPECIFICATIONS — RECEIVER: Sensitivity: Less than 0.35 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **SSB selectivity:** 2.1 kHz minimum at 6 dB down; 7 kHz maximum at 60 dB down (3.395 MHz filter). **CW selectivity:** (with optional SBA-301-2 CW crystal filter installed); 400 Hz min. @ 6 dB down; 2.0 kHz max. @ 60 dB down. **Input:** Low impedance for unbalanced coaxial input. **Output impedance:** 8 ohm speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 dB. **TRANSMITTER: DC power input:** SSB, (A3J emission) 180 watt PEP (normal voice, continuous duty cycle). CW, (A1 emission) 170 watts (50% duty cycle). **RF power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 ohm nonreactive load). **Output impedance:** 50 ohm to 75 ohm with less than 2:1 SWR. **Oscillator feed-through or mixer products:** 55 dB below rated output. **Harmonic radiation:** 45 dB below rated output. **Transmit-receive operation:** SSB: PTT or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. **CW side-tone:** Internally switched to speaker or headphone in CW mode. Approximately 1000 Hz tone. **Microphone input:** High impedance with a rating of –45 to –55 dB. **Carrier suppression:** 45 dB down from single-tone output. **Unwanted sideband suppression:** 45 dB down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 dB down from two-tone output. **RF compression (TALC*):** 10 dB or greater at .1 mA final grid current. **GENERAL: Frequency coverage:** 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 hertz per hour after 30 minutes warmup from normal ambient conditions. Less than 100 Hz for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial calibration:** 5 kHz. Calibration: 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz. **Transistors:** MPF105 FET–VFO; 2N3393–Voltage regulator. **Rear apron connections:** CW Key jack; 8 ohm output; ALC input; Power and accessory plug; RF output; Spare. **Power requirements:** 700 to 850 volts at 250 mA with 1% maximum ripple; 300 volts at 150 mA with .05% maximum ripple; –115 volts at 10 mA with .5% maximum ripple; 12 volts AC/DC at 4.76 amps. **Cabinet dimensions:** $14\frac{13}{16}$" W x $6\frac{5}{16}$" H x $13\frac{3}{8}$" D.

*Triple Action Level Control™



New Heathkit® Wattmeter . . . $29.95*

You asked for it . . . a low cost high quality Heathkit wattmeter. New HM-102 measures RF power output from 10-200 W and 100-2000 W in two switch-selected ranges. Built-in calibrator permits 10% accuracy throughout the 80-10 M bands. Built-in SWR capability. Negligible loss permits permanent insertion in any 50 ohm line. Exclusive remote detector allows placement of meter in any location. Put the new HM-102 in your shack now . . . it's another powerful value from the Hams at Heath.

Kit HM-102, 3 lbs.	**$29.95***

The only difference between the new Heathkit® Frequency Counter and those costing $400

...is the price $199.95*

14570
HZ
HEATHKIT
FREQUENCY COUNTER
OFF
ON
KHZ
HZ
INPUT

Compare performance & features of the IB-101 to counters selling for twice the price! Counts from 1 Hz to over 15 MHz; advanced IC design eliminates blinking readout and divider chain adjustment.

8-digit capability. Set the range switch to kHz and read to the nearest kHz . . . push the range switch to Hz and read down to the last Hz. Overrange & Hz/kHz indicators light up to give correct range at all times; do an 8-digit measurement with 5-digit readout.

Exclusive Heath-designed input circuit. Dual gate, diode-protected MOSFET design provides proper triggering without adjustment from less than 100 mV to over 200 V. Input Z is 1 megohm shunted by less than 20 pF to minimize circuit loading & error.

Other features include sockets for all 26 IC's and 5 display tubes . . . double-sided, plated-thru fiberglass circuit board . . . 120/240 VAC operation . . . convenient handle/tilt-stand. Compare the new Heathkit IB-101 to the $400 models . . . and discover that $199.95 buys more counter.

Kit IB-101, 7 lbs. **$199.95***

IB-101 SPECIFICATIONS: Frequency Range: 1 Hz to greater than 15 MHz. **Accuracy:** ±1 count ± time base stability. **Gate Times:** 1 millisecond or 1 second with automatic reset. **INPUT CHARACTERISTICS – Sensitivity:** 1 Hz to 1 MHz, less than 100 mV rms. 1 MHz to 15 MHz, less than 250 mV rms, after 30 minutes warmup. **Trigger Level:** Automatic. **Impedance:** 1 Megohm shunted by less than 20 pF. **Maximum Input:** 200 V rms. DC – 1 kHz. Derate at 48 V per frequency decade. **TIME BASE: Frequency:** 1 MHz, crystal controlled. **Aging Rate:** Less than 1 PPM/month after 30 days. **Temperature:** Less than ±2 parts in 10^7/degree C. 20 to 35 degrees C after 30 minutes warm-up. ±.002% from 0 to 40 degrees C. **GENERAL: Readout:** 5 digits plus overrange ambient. **Temperature Range:** Storage; –55 to 80 degrees C. Operating; 0 to 40 degrees C. **Power Requirements:** 105-125 or 210-250 VAC, 50/60 Hz, 8 watts. **Cabinet Dimensions:** 8¼" W x 3⅛" H x 9" D not including handle. **Net Weight:** 4½ lbs.

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Model 14A, 12 volt DC converter	**$39.50**

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FEBRUARY, 1971 VOL. 27, NO. 12

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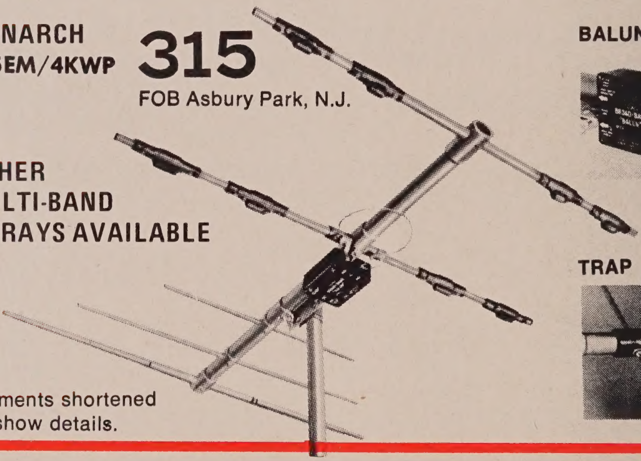
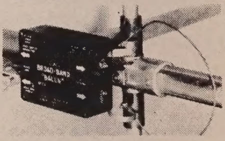
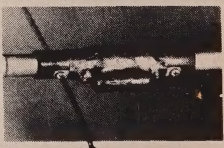


Elements shortened to show details.

BALUN



TRAP



TYPICAL TELREX MONOBAND ANTENNAS

Mod. 15M317-	15 mtr. 3 el. rotary,	10 DB gain,	4 KWP pow. rat.,	2 1/2"O.D.x17' boom		$165.00
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Mod. 2M6C-	2 mtr. 6 el. array,	14 DB gain,	300 W pow. rat.,	1" x 9' boom	....	18.50
Mod. 2M814C-	2 mtr. 8 el. array,	16.5 DB gain,	300 W pow. rat.,	1.375"x14' boom	....	32.50
Mod. 6M5C-	6 mtr. 5 el. array,	13 DB gain,	400 W pow. rat.,	1.5" x 16' boom	....	39.00

SINCE 1921 **telrex** Communications and TV Antennas **LABORATORIES**

Asbury Park, New Jersey 07712 201-775-7252

ZERO BIAS

Over the years numerous suggestions for improving the structure of US amateur regulations have been made. Some have met with good success and have actually become part of our Rules and Regulations, while the majority have failed to win official approval for one reason or another. Among those which never made it through are several which should have or which, in view of the continually changing amateur scene, warrant fresh consideration.

On December 1, 1970, *CQ* petitioned FCC for rule changes on three points, none of which is really new, but all of which are thoroughly valid proposals for 1971 conditions. Briefly, the proposals are: 1. Reduction of the code speed requirement for the General class license from 13 words per minute to 10 w.p.m. 2. Permitting Technician class licenses full Novice class c.w. privileges on the 80, 40, and 15 meter bands. 3. Reinstate phone privileges for Novice class licenses in the 2-meter band.

Each of these proposals has as its aim the closer coordination and intermingling of all license classes with a goal of encouraging the advancement of lower class licensees to the General and higher-class.

Elaborating on these three proposals, in the wording of the proposal to FCC: "...the code speed requirement for obtaining the General class amateur license be reduced from the present requirement of 13 words per minute to 10 words per minute.... Such code speed reduction would enable many tens of thousands of currently licensed Novices and Technicians to upgrade their status within the amateur ranks by eliminating the largest single barrier to upgrading, i.e., the "code hump phenomenon" that occurs for most operators between 11 w.p.m. and 13 w.p.m.....

"... Technician class licensed radio amateurs should be granted c.w. privileges on the same frequencies as those currently allocated for Novices. This change would enable many tens of thousands of current Technician license holders to adequately practice code operation, with the ultimate end of increasing their speed and upgrading their license status. At the present time, too little opportunity for c.w. practice occurs within those frequencies allotted to technician class licensees, and most technicians are unable to find sufficient practice opportunities under the present system. Since holders of the technician class license may not apply for a Novice class license, this proposal is the simplest solution to the problem.

Although the original intent in creating the Technician class license was to make available the v.h.f. amateur bands to the experimenter and radio-controlled model enthusiast, it must be recognized that in the years since the inception of this class of license, it's real function has changed dramatically. While a certain small percentage of Technician class licensees do indeed utilize their privileges for experimentation and model control, the vast majority of Technician class licensees are engaged in regular, two-way communications on the h.f. bands. It is the carefully researched opinion of the petitioner that given the opportunity to obtain a General-class or higher license permitting operation on the h.f. amateur bands, a significant majority of current Technician class licensees would so avail themselves.

".... Phone privileges should be reinstated for Novice class licensees on the two meter amateur band between 145 mc and 147 mc. With the major increase in activity on these frequencies that has developed from the introduction of v.h.f. repeaters throughout the United States, such a change would better enable holders of the Novice license to develop good operating phone techniques to further prepare them for international phone conversations at such time that they upgrade themselves for such privileges on the h.f. frequencies...."

We hope that these proposals meet with positive reaction at FCC for we feel that all are in the best interests of the hobby at this stage of its development. With the limited numbers of new amateurs entering the hobby each year, we feel that every effort to encourage them to stay and progress is warranted.

EIA Proposal

Last month we took rather strong exception to a proposal out of the Electronics Industires Association regarding shared amateur and CB use of the 2-meter band. While we have not changed our negative opinion of the idea, we do feel that some clarification is in order.

The proposal by EIA was not presented to FCC nor was it intended to be in its original draft form; Rather, the proposal was intended to provoke discussion within EIA prior to drafting a proposal suitable for presentation to FCC. If we offended anyone at EIA by jumping with both feet on an idea before it was ready, we apologize, but we still think that the answer to the problems of the Citizens Band lie somewhere other than the amateur 2-meter band.

Happy 25th Anniversary, Carl...

... Carl Mosley, WØFQY, that is, whose company, Mosley Electronics, has just celebrated its twenty-fifth anniversary. Carl has been one of *CQ's* oldest and heaviest supporters down through the years, and we're of the feeling that amateur radio is just that much better for having a man like Carl in the ranks. Those of you who have ever done business with the Mosley's know that they've managed to find that rare combination of quality in product with a standard of ethics second to none. So here's to Carl with the hopes that the next twenty five years will be as good to him as he has been to ham radio.

73, Dick, K2MGA

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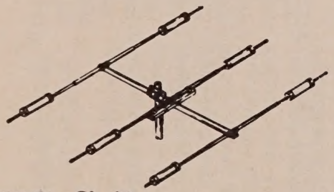

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Designed to provide the extra gain for working hard-to-reach DX. Incorporates the exclusive Mosley patented "Balanced Capacitive Matching". Features include six Trap-Master traps with resonant frequency stability, improved boom for even wider element spacing. Stainless Steel hardware. Fits up to 2" mast. Use with most heavy duty rotors. The CL-33 is designed for 1000 watts AM/CW or 2000 watts P.E.P. SSB.

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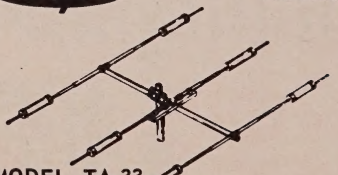
Free offer expires December 31, 1971.

TRAP MASTER

Multi - Band Beams



MODEL TA-33
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The most widely used 3-element beam in the amateur universe. The TA-33 features the Mosley "Trap-Master" traps, known for rugged construction and resonant frequency stability under all weather conditions. Power rated: 2000 watts P.E.P. SSB.

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10, 15, & 20 meters

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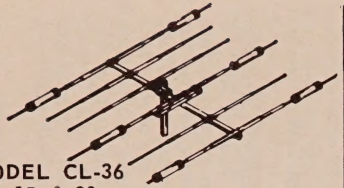

MODEL CL-36
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The Classic 36, incorporating the Mosley superior feed system 'Balanced Capacitive Matching'. This wide-spaced, six-element beam employs 4 operating elements on 10 meters, 3 operating elements on 15 meters and 3 operating elements on 20 meters. Automatic bandswitching is accomplished through Mosley designed high impedance paralleled resonant "Trap-Circuits".

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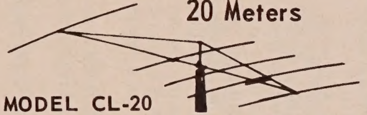

MODEL CL-20

The improved electrical balance, "Balanced Capacitive Matching," combines with optimum spacing to provide maximum gain, increased bandwidth for greater efficiency in performance.

MODEL CL-203

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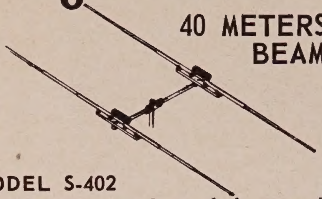
10 meter coil	MD-10
15 meter coil	MD-15
20 meter coil	MD-20
40 meter coil	MD-40
75/80 meter coil	MD-78
Matching Network	MD-48

Signal·Master 40 METERS BEAM



MODEL S-402

For a top signal needed to push through 40 meter QRM, the Mosley Signal Master S-402 will do the trick! This 100% rust-proof 2-element beauty constructed of rugged heavy-wall aluminum is designed and engineered to provide the performance you need for both DX hunting and relaxing in a QRM free rag-chewing session. Beam is fed through coupling, resulting in an excellent match over the entire bandwidth.

TRAP MASTER Multi - Band Verticals

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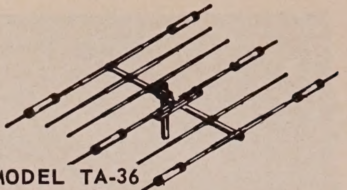
MODEL RV-4C

Mosley RV-4C, vertical antenna is ideal for installation where space is an important factor. Designed for 10, 15, 20, and 40 meters. With automatic bandswitching. Entirely self-supporting.



MODEL TA-36
10, 15, & 20 meters

The voice of authority! This wide-spaced 6-element configuration employs 4 operating elements on 10 meters, 3 operating elements on 15 meters, and 3 operating elements on 20 meters. Automatic bandswitching is accomplished through the Mosley exclusively designed high impedance paralleled resonant "Trap-Circuits".

For more information see your nearest Mosley Dealer or specify area of interest and write factory direct.
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DIAL

The No. 10031 Dial is a rugged turns counter dial designed for direct crank-handle drive of multi-turn devices such as vacuum variable capacitors, rotary inductors, multi-turn potentiometers, permeability tuned inductors, etc. It has a 0-99 turn digital readout plus a 0-100 vernier scale. The output coupling is a hub for 1/4" diameter shafts. The design includes a built-in dial lock.

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OUR READERS SAY

Multiband Loop

Editor, *CQ:*

I want to congratulate Malcolm Bibby, GW3-NJY/W8, for his great article "An Efficient Multiband Loop Antenna," (Oct. *CQ*, p. 28). Malcolm presented his loop antenna in a very clear and logical manner.

After building the multiband loop and placing it on the roof I learned that the 75 ohm coax had a lower s.w.r. than either the 52 or 100 ohm coax. I am very happy with my antenna and feel it is by far the best antenna possible for the amount of time and effort put into it.

Scott M. Rathjen, WA7LDZ
Portland, Oregon

Ham-M Rotor Indicator

Editor, *CQ:*

VK9GN's article entitled "Improving the Ham-M Rotor Indicator" in December '70 *CQ* should be of useful value to many hams. However, I would like to point out that there is a serious error in the fig. 3 schematic on page 58. Unfortunately, it is shown with thet series regulator shorted out. You can correct this by telling your readers to remove the connection shown between collector and emitter of Q^2. I found it then works FB on my TR-44 which has a Series 3 indicator like the Ham-M.

Dennis G. Edsten, W9DDL
Loves Park, Il.

Iambic Keyer

Editor, *CQ:*

I constructed an iambic keyer following figure three of the article on Electronic Keyers. The circuit worked as described once I found and corrected an error in the diagram. Pins six and nine of IC_1E were transposed, causing the keyer to send dots only.

I might add that I am using three General Electric rechargeable nicad cells to supply 3.75 v.d.c. maximum to the ICs. The 3.75 v. falls within 3.6 v. ±10% called out in the Motorola *Semiconductor Data Book*, Fourth Edition. Low long-term cost and voltage stability are realized using nicad cells.

Richard L. Hampson, WB6HOB
Sante Fe Springs, Ca.

Neutralization and C.W.

Editor, *CQ:*

Two comments on the December 1970 issue:

J. J. Fredot's note in "Our Readers Say" regarding neutralizing procedures appears to have an error in the last sentence where he says—"By readjusting the neutralizing capacitor until the grid current increases on either side of resonance with final fully loaded, the final will be completely neutralized..." According to page 453 of Cruft Electronics Staff, *Electronic Circuits and Tubes,* McGraw-Hill, 1947, "For proper neutralization, *C*n is set so that both maximum

Separately they're great!

R. L. Drake quality-built R-4B Receiver is versatile, accurate, dependable, as is the Drake T-4XB Transmitter. They stand on their own merits used independently, but . . .

TOGETHER they're incomparable!

Ideal for transceiving, 160 and MARS

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4
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• **Covers ham bands** 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished; MARS and other frequencies with accessory crystals, except 2.3-3, 5-6, 10.5-12 Mc. • **Upper and Lower Sideband** on all frequencies • **Automatic Transmit Receive Switching on CW** (semi break-in) • **Controlled Carrier Modulation for AM** is completely compatible with SSB linear amplifiers • **VOX or PTT** on SSB and AM built-in • **Adjustable Pi-Network Output** • **Two 8-pole Crystal-Lattice Filters** for sideband selection, 2.4 kc bandwidth • **Transmitting AGC** prevents flat topping • **Shaped Grid Block Keying** with side tone output • **200 Watts PEP Input on SSB**— 200 watts input CW • **Meter indicates plate current and relative output** • **Compact size; rugged construction** • **Solid State Permeability Tuned VFO** with 1 kc divisions • **Solid State HF Crystal Oscillator** • **11 Tubes, 3 Transistors and 12 diodes** • **Dimensions:** 5½"H, 10¾"W, 12¼"D. **Wt.:** 14 lbs. **$495.00** Amateur Net.

R-4B
RECEIVER

• **Linear permeability tuned VFO** with 1 kc dial divisions. VFO and crystal frequencies pre-mixed for all-band stability • **Covers ham bands** 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished • **Any ten 500 kc ranges between 1.5 and 30 Mc** can be covered with accessory crystals for 160 meters, MARS, etc. (5.0-6.0 Mc not recommended) • **Four bandwidths of selectivity,** 0.4 kc, 1.2 kc, 2.4 kc and 4.8 kc • **Passband tuning** gives sideband selection, without retuning • **Noise blanker that works on CW, SSB, and AM** is built-in • **Notch filter and 25 Kc crystal calibrator** are built-in • **Product detector** for SSB/CW, **diode detector** for AM • **Crystal Lattice Filter** gives superior cross modulation and overload characteristics • **Solid State Permeability Tuned VFO** • 10 tubes, 10 transistors, 17 diodes and 2 integrated circuits • **AVC** for SSB or high-speed break-in CW • **Excellent Overload and Cross Modulation characteristics** • **Dimensions:** 5½"H, 10¾"W, 12¼"D. **Wt.:** 16 lbs. **$475.00** Amateur Net.

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grid current and minimum plate current occur at the same setting of the tank-circuit capacitance." I have used this criterion several times and find the procedure not too difficult. First one must tune for plate current dip and then switch to grid current and observe what happens when the plate circuit is detuned by increasing tank capacitance. Then one should switch back to plate current and redip it. This is followed by switching back to grid current and observing what happens when the plate circuit is now detuned by decreasing plate tank capacitance. If in both cases detuning of the plate circuit is

[*Continued on page 81*]

Announcements

American Novice Net

The American Novice Net (A.N.N.) is looking to increase their membership. They have daily meetings on the air and operate on a nationwide basis. For complete details write to Thomas Behrens, WN6MDP, 6664 Lake Park Drive, Sacramento, California 95831.

Correction

There is an error in the diagram of the final version of the modification to improve the Ham-M Indicator (*CQ,* Dec. 1970, p. 58). In fig. 3, the connection shown between the emmiter and collector of Q_2 should not be there. The collector and emmiter are not connected.

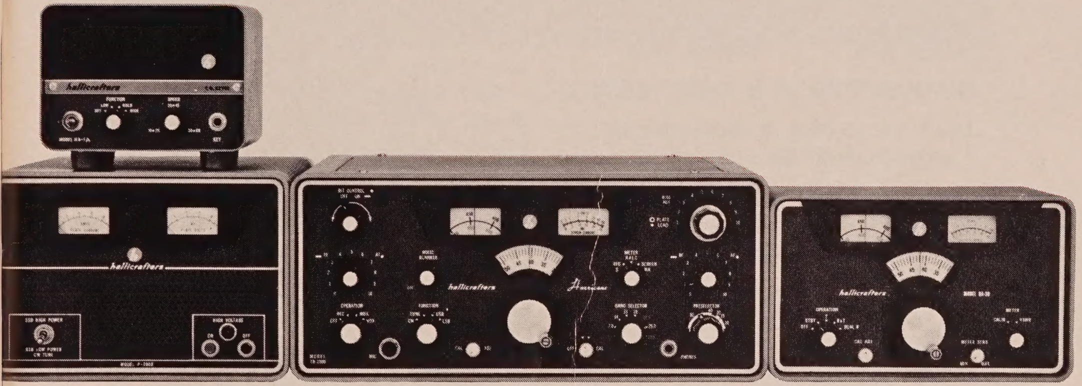
Benton Harbor, Michigan

The Blossomland Amateur Radio Association 4th annual auction and Swap-Shop at Shadowland Ballroom, St. Joseph-Benton Harbor, Mich. Sunday, March 14th 9:00 A.M. to 4:00 P.M. Hot Food. Prefer to do your own selling? Rent one of their swap tables. If that fails their skilled auctioneer will put your gear on the block. Direct inquiries to B.A.R.A., Box 175, St. Joseph, Mich. 49085.

Gary, Indiana

The Lake County Amateur Radio Club, Inc., Gary, Indiana, announces its 18th annual LCARC Banquet to be held at 6:20 P.M. on Feb. 20, 1971. It will be held at Teibel's Restaurant at the corner of U.S. 30 and U.S. 41, in Schererville, Indiana. There will be a chicken dinner, entertainment, and awards. Tickets are $5.00 each from Herbert S. Brier, W9EGQ, Ticket Chairman, 385 Johnson St., Gary, Indiana, 46402, or from other club members. No tickets will be sold at the door.

be a big sender.



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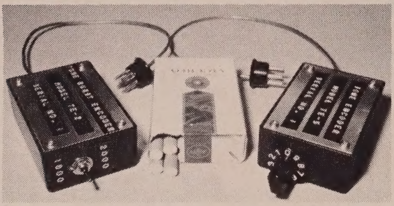

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Transceiver: Make.......... Model..........

SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

Hot doggie!! We amchoors are in for some grate fun, and some grate confewshun, if the Hon. Yewnited States desides to go ahead with a program it now investigating.

For examples, assuming you want to buy some shirts—so the clerk asks you what size you want to buy, and you tell him "size 38-81." Or your svelte XYL goes out and buys a size 40 dress.

You thinking I crazy, Hon. Ed? No indeedy, on acct. that's what happening if our country desides to go to the metric system. A size 15-32 shirt becomes a 38-81, and a size 14 dress is size 40 (centimeters of course).

Don't sit there with your big feets on your desk ignoring this, Hon. Ed. It can happening. In fackly, amoung the big countries, only Canada and the Yewnited States are still using the old-fashyuned inch-pound system. And boy, will it making a diffrunce in our lives. After all, we can't be hiding our lite under 35.25 liters.

You'll be worring about your 100 cm. wasteline, and your XYL will be baking a cake in a 20 cm. pan in a 200 degree (*Celsius*) oven.

As you working mobile, you'll be making sure you not going any faster than 80. That's kilometers per hours, natchyourally. The speed limit will being 104 kilometers per hour. And, when you get caught in traffic, you'll just have to 2.54 cm. along.

While it seeming like this are reel crazy system (one you wouldn't touching with a 3.05 meter pole), it reely are lots simpler than system we having now. There being only three basic units in metric system—meters, for length, liters for capacity, and grams for weight.

Of coursely, you have to useing all kinds

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Type EX Crystal

Available from 3,000 KHz to 60,000 KHz. Supplied only in HC 6/U holder. Calibration is ±.02% when operated in International OX circuit or its equivalent. (Specify frequency)

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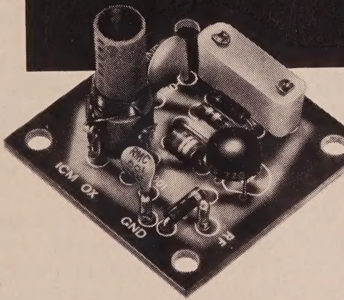
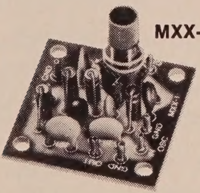


OX OSCILLATOR

Crystal controlled transistor type.
Lo Kit 3,000 to 19,999 KHz
Hi Kit 20,000 to 60,000 KHz
(Specify when ordering)

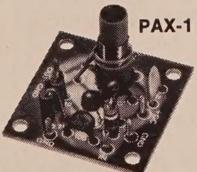
$2.95

MXX-1 Transistor RF Mixer **$3.50**
A single tuned circuit intended for signal conversion in the 3 to 170 MHz range. Harmonics of the OX oscillator are used for injection in the 60 to 170 MHz range.
Lo Kit 3 to 20 MHz
Hi Kit 20 to 170 MHz
(Specify when ordering)



MXX-1

SAX-1



PAX-1

BAX-1

SAX-1 Transistor RF Amplifier **$3.50**
A small signal amplifier to drive MXX-1 mixer. Single tuned input and link output.
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Hi Kit 20 to 170 MHz
(Specify when ordering)

PAX-1 Transistor RF Power Amplifier **$3.75**
A single tuned output amplifier designed to follow the OX oscillator. Outputs up to 200 mw can be obtained depending on the frequency and voltage. Amplifier can be amplitude modulated for low power communication. Frequency range 3,000 to 30,000 KHz.

BAX-1 Broadband Amplifier **$3.75**
General purpose unit which may be used as a tuned or untuned amplifier in RF and audio applications 20 Hz to 150 MHz. Provides 6 to 30 db gain. Ideal for SWL, Experimenter or Amateur.

Write for complete catalog.

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Our TRC-24 is the perfect mobile rig. A mere 1-3/4x6x7", yet packs more power than models *twice* its size: over 3 watts output, 5 watts input. Integrated circuit, noise limiter, "hot" 0.5μV sensitivity at 10 dB S + N/N.

Our Navaho is the first low-cost base/mobile model with every important extra. Range Boost, on-the-air and modulation lights, S/RF meter, headphone/external-speaker jacks, dual power supplies for car or base.

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prefixes, like "centi," "deci" and "kilo." A centimeter being 1/100 meter, and a kilometer being 1000 meters. You just moving decimal points back and forth, so three units being all you needing.

But you going to have to make adjustments. Like say, you designing new antenna for ten meter band. You needing to know how long is full wavelength. So, you looking up formula in book, and it saying length (in feet) is 936 divided by freakwency in kilocycles (it may say kilohertz if it being new edishun).

So, dividing 936 by 28.5 kilocycles, you getting 32.8 feets. Now you got to converting that to meters. Looking up metric convershun table and seeing that 1 foot equaling 0.305 meters. So, you multiplying 32.8 feets by 0.305 and you getting an answer of 10.0 meters.

Hey, Hon. Ed., how about that!! Wavelength in meters of full-wave antenna for ten meter band are ten meters! So that's why they calling it the ten meter band!!

So, all you having to do is going down to the local Hardware Emporium and getting a free yardstick—oops, I meen a free meterstick—or, if you got lots of bux, buying a 15 meter steel tape, so can measuring off ten meters.

Either that, or using old steel rule and measuring off 32.8 feets. Of coursely, your old 50 foot steel tape not divided into tenths of a foot, so to finding out what 0.8 feets is, you multiplying 12 (number of inches in a foot) by 0.8, and you getting 9.6 inches.

Still not in the cleer. You needing to know how much of an inch is 0.6 inches, on acct. steel tape divided into sixteenths of an inch. So, you multiplying 16 times 0.6, and you getting 9.6 again! That meening 9.6 sixteenths of an inch. Or, it meening 9/16 of an inch plus a tad.

I know you glad to be getting all this info, Hon. Ed., so you can advising all Hon. Seek-You reeders of possible problems ahead. After all, a gram of prevenshun is worth a kilogram of cure.

On other hand, Yewnited States been worring about this convershun to the metric system for cupple hundred yeers. So, I could be wrong about the hole thing. You know what they saying..."a miss is as good as 1.61 kilometers."

Happy Amchoor Day.

Respectively yours,
Hashafisti Scratchi

Pro CW from amateur fingers.

Ten-Tec's KR 40 squeeze keyer makes the perfect signal from the imperfect hand. Built-in memories insert characters in correct place and spacing with only a momentary closure of either paddle. Spacing and speed are adjustable to match your sending speed, from 6 to 60 words per minute. Built-in monitor provides side tone for headphones, speaker or off-the-air practice. Output is handled by reed relay. Circuitry is all solid state. The KR 40 is a good looking, rugged keyer with a beautiful feel. Easy to learn. Easier to use.

OUR BEST FOR THE SERIOUS AMATEUR $89.95

Write for complete information on the Ten-Tec family of five keyers. Priced from $34.95. Send coupon to:

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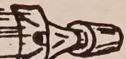

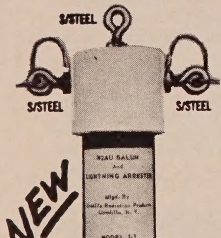
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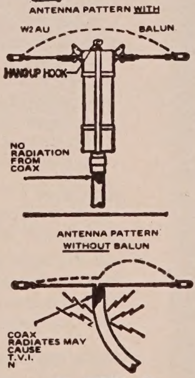
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Comes in 2 models. 1:1 matches 50 or 75 ohm unbalanced (coax line) to 50 or 75 ohm balanced load. 4:1 model matches 50 or 75 ohm unbalanced (coax line) to 200 or 300 ohm balanced load.

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Top performing transceivers coupled with your choice of the world's best 2 meter antennas means a winning combination with capability...

SPECIFICATIONS:

Transmitter:

- Frequency Range: 143-149 MHz
- Antenna Impedance: 50 ohms nominal
- Power Requirements: 12-14v DC
- Transmitter: 5 watts (10w with AC-210 power booster)
- Microphone: High Z
- Deviation: Adjustable narrow or wide band with clipper filter also adjustable for optimum clipping lever

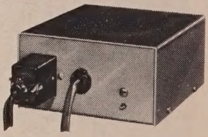
Receiver:

- Sensitivity: SINAD .5 uv for 12 db
- Quieting: 1 uv provides 20 db
- Squelch: Continuously adjustable
- Modulation Acceptance: FM wide band (narrow band available on special request)
- RF Circuitry: FET front end and duo conversion for minimum cross modulation and overload
- IF Frequency: 10.7 MHz and 455 KHz.
- Frequency Control: 3 channel transmit, 3 channel receive. (146.94 MHz furnished) Transmit and receive frequencies independent of each other
- Audio Output: 3 watts from internal 3.2" speaker

Order #813. Price $229.50

AC-210 POWER BOOSTER

Use the AC-210 on 115v AC or 12v DC to provide AC operation and 10 watts input. Supplied with mounting brackets for permanent mobile installation. Order #814. Price $49.00.



MMB MOBILE MOUNTING BRACKET

Mounting bracket provides positive mounting and quick disconnect for easy removal. Between half of the mount is removable when not being used to conserve space.

Order #816. Price $5.95

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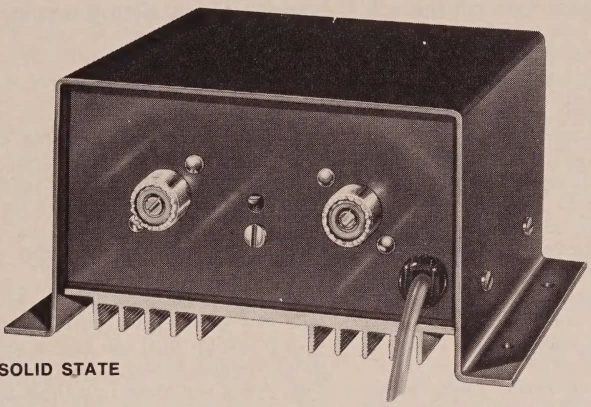
PA-210 2 Meter 35 Watt Mobile Amplifier



SOLID STATE

This all new ruggedized solid state two meter mobile amplifier provides 35 watts output to greatly increase your communication range. The PA-210 is a must for areas where no repeater is available. The PA-210 is designed as a companion for the FM-210. (When used as a system, the AC-210 power booster is not required.) A unique circuit protects the output transistor from voltage spikes and surges. All change over relay functions are internal and controlled by FM-210 circuitry through a connecting cable.

SPECIFICATIONS:

- Input Voltage: 12v DC, negative ground only
- Power Input: 60 watts
- Power Output: 35 watts
- Frequency Range: 143 MHz to 149 MHz
- Operation: Class C
- Drive Requirements: 5½ watts required for 35 watts output (the PA-210 provides operating voltages to the FM-210 for high power operation)
- Antenna Requirements: 50 ohms unbalanced

Order #815. Price $149.95

HY-GAIN 764 ⅝ WAVE GAIN ANTENNA FOR TWO METER MOBILE

Model 764 ⅝ wave antenna with 3 db gain professional mobile antenna for two meters provides the highest gain and best matched performance (52 ohms) than any other mobile antenna on the market. Handles 110 watts and is constructed of 17-7 ph stainless steel with chrome plated hardware. It features an etched copper matching coil on a G10 epoxy fiberglass board. Exclusive claw mount fits any size hole ⅜ to ¾". Easy installation and high power capability. Supplied with 22' of RG-58/U coax and PL-259 connector.

Order #764. Price $26.50

Hy-Gain 764 Gain Antenna
for 2 Meter Mobile

GALAXY ELECTRONICS DIVISION
HY-GAIN ELECTRONICS CORPORATION
P.O. Box 5407-FB, Lincoln, Nebraska 68505

An Introduction To VHF FM

FM Techniques For Non-FMers

BY FRED BROWN,* W6HPH/G

F.m. offers several significant technical advantages over conventional a.m. operation, and some over s.s.b. W6HPH explores these merits, and proceeds to describe the construction of two accessory devices needed to receive and transmit proper f.m. on the v.h.f. bands using existing equipment.

FREQUENCY modulation has been with us for a long time but until recently has not been given the attention it deserves as a serious communication mode for our v.h.f. and u.h.f. bands. This is especially surprising in view of f.m.'s well known advantages over other modes of voice communication. Its superiority over a.m. was pointed out in an amateur publication as long ago as 1941. In that year both Grammar and Crosby showed that for weak-signal voice communication n.b.f.m. was readable at a 6 db weaker signal level than a.m.[1,2]

F.m. may have been much more widely adopted if World War II had not intervened. The ending of the war made surplus large quantities of v.h.f. equipment which, unfortunately, was mostly a.m. Also, the crystal-controlled converter / communications receiver combination became the accepted norm for v.h.f. reception and very few receivers were equipped with f.m. adapters. As a result of these and other unfortunate circumstances our v.h.f. bands became standardized on Ancient Modulation.

Of course, the phone bands below six meters are much too crowded for f.m. to be seriously considered. But on the v.h.f. and u.h.f. bands, where there is a vast surplus of spectrum available, the advantages of f.m. become particularly persuasive.

Among these advantages are:

1. Simplicity. No high-power audio equipment needed. You can modulate a kw with a transistor. F.m. transmitters can be even simpler than c.w. transmitters. For example, see fig. 1.
2. Freedom from the audio rectification type of BCI, Hi-Fi-I, etc., that plagues a.m. and s.s.b. operation.
3. Freedom from feedback due to audio rectification within the transmitter speech amplifier.
4. No cross-modulation of nearby receivers.
5. Superiority to a.m. in weak-signal reception, even when slope detected; see below.
6. The transmitter final can be operated as a highly-efficient class-C amplifier with no need to worry about linearity.
7. Final amplifier peak voltages are only 1/4 the a.m. case of equal carrier power.
8. A transistor final can be run at twice the collector voltage, before breakdown, as in the a.m. case, which can mean four times as much power output.
9. F.m. can be run through varactor multipliers without distortion.
10. The extreme frequency stability requirements of s.s.b. are avoided.
11. No a.v.c. problems in the receiver.
12. Greater immunity to impulse type noise than a.m. or s.s.b.
13. Reduced mobile flutter.
14. Lighter weight portable equipment.

Slope Detection

Although I had used f.m. off and on for many years, up until recently I had thought it would

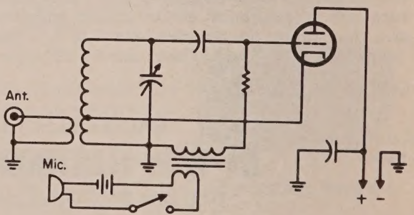


Fig. 1—The simplest possible complete radiotelephone transmitter demonstrates one major advantage of f.m.

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*Brockwood School, Bramdean near Alresford, Hants, England.

[1] G. Grammer, "Some Thoughts on Amateur FM Reception," *QST,* March 1941, page 9.

[2] M. G. Crosby, "Band-width and Readability in Frequency Modulation," *QST,* March 1941, page 26.

cost too much in terms of weak-signal readability to justify converting the main transmitter over from a.m. to f.m. This is because most v.h.f. men are using conventional communications receivers without f.m. adaptors; they receive f.m. signals by tuning off to the side—a technique known as "slope detection."

Just how much signal-to-noise ratio I would loose in going from conventional a.m. to slope-detected f.m. I did not know. Some authorities (?) had said as much as 6 db. This price I considered too much to pay. But surprisingly, even though it would have been a simple experiment, evidently no one had bothered to find out empirically just what the difference really is.

Accordingly, an on-the-air experiment in weak-signal readability was conducted between K6JYO, about 60 miles away, and this station. We compared a.m. and slope-detected f.m. of the *same carrier power* and found that a.m. had the edge. But that edge was a mere *2* db. The experiment was first carried out on 432 mc with a transmitter that could be switched from a.m. to f.m. We next tried it on a different band (2 meters), in the opposite direction, using a different receiver, and a different transmitter (which also could be switched from a.m. to f.m. without changing the carrier level). The results were nearly identical in both cases. Precision step attenuators were used between the v.h.f. converters and communications receivers to set the received signal at just the threshold of readability.[3] Identical speech processing (clipping and filtering) was used on both a.m. and f.m. in both experiments.

Interestingly, we found that best results for weak-signal slope-detection occurred with narrow band f.m. (2 or 3 kc peak deviation) received on a square-passband receiver. In my receiver it was a 3 kc mechanical filter that gave best results. Tuning was quite critical—almost like tuning in an s.s.b. station.

Of course, the term "slope detection" is not very appropriate when applied to a square-passband filter, since for such a case there really is no "slope." Detection takes place because one-half of the f.m. sidebands are rejected by the filter. and the remaining carrier and sidebands produce an a.m. envelope which can be demodulated by the receiver's a.m. detector.

It should be emphasized that the 2 db advantage of a.m. over slope-detected f.m. is on the basis of equal *carrier* powers. Since the *total* power of an a.m. signal is greater than that of the unmodulated carrier, a comparison on the basis of *total* power makes a.m. look even worse. Take, for instance, the case of a 100% sine-wave amplitude modulated carrier. The total power (sidebands plus carrier) is 50% more than the carrier power alone, an increase of 1.5 db. That makes the 2 db advantage of a.m. shrink to a paltry 1/2 db. And for the case of square-wave modulation, which is a close approximation to heavily clipped speech, the total power output increase is 100%, or *3 db*. Under this more realistic assumption *f.m. is actually superior to a.m. even when slope detected!!*

Of course, when *properly* detected with a good discriminator, f.m. will outshine a.m. by many more db.

Viewed in this light it would seem that the conversion of our v.h.f. bands to f.m. is long overdue. In recent years there has been a large number of obsolete commercial f.m. transceivers appearing on the air. Unfortunately, most of these rigs were designed for the old standard of 15 kc deviation (designated by the FCC as 36F3 modulation), which does not give as good weak-signal performance as the modern standard of 5 kc (16F3) deviation. As far as the transmitter goes, this older equipment can be made compatible with n.b.f.m. standards simply by turning down the deviation, or audio gain, or even by backing off from the microphone, to reduce the peak deviation. The receivers are too broad to give good weak-signal performance, but are of very limited utility anyway since they are fixed-tuned.

FM vs. SSB

Ask any serious v.h.f. man what the ultimate form of modulation for weak-signal voice communication is and he inevitably will answer, "single sideband." To compare f.m. with s.s.b. would seem almost heretical. Yet the comparison was made by a research group at Motorola Laboratories and the results published in the *IRE Proceedings* more than a decade ago.[4] Their findings were not very favorable to s.s.b. For instance, in comparing an s.s.b. transmitter of 135 watts p.e.p. output with an f.m. transmitter of 60 watts output, the observable weak signal advantage of s.s.b. over f.m. was only 1 or 2 db.[5]

When the cost, complexity, and other disadvantages of s.s.b. are taken into account it would seem questionable that the 1 or 2 db advantage gained is worth the trouble. Especially when consideration is given to what the same amount of money and effort would accomplish if expended on antenna height or gain.

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[3] This technique is accurate if the total attenuation between converter and receiver is large: i.e., receiver noise completely obliterates con-converter and antenna noise.

[4] R. Richardson, O. Eness, and R. Dronsuth, "Experience With Single-Sideband Mobile Equipment," *Proceedings of the IRE*, June 1957, page 823.
See also the discussion, "Mobile Single Sideband Equipment," *Proceedings of the IRE*, December, 1957, page 1736.

[5] That might seem like a power output disparity in favor of s.s.b. Actually, final amplifier plate dissipation was the same in both cases. The intermittent nature of speech makes it hard to compare s.s.b. and f.m. on the basis of power output.

Generation of FM

Frequency modulation of an existing transmitter is usually quite simple, especially if it is v.f.o. controlled. To frequency modulate a self-excited oscillator all that is needed is a few volts of audio applied to an active element (grid or plate of a tube, base or collector of a transistor). Under most circumstances this will result in more than enough frequency deviation.

In my early days as a ham I remember making f.m. transmitters for six meters using only one tube. The circuit was a Hartley oscillator coupled directly to the antenna, fig. 1. Audio voltage from a telephone microphone and flashlight cell was stepped up with a microphone transformer and applied in series with the oscillator grid resistor. You might scoff at such a primitive set-up, but signal quality of this minimal-complexity transmitter was remarkably good.

Although frequency modulation of an *L-C* controlled ocillator is extremely easy, the same cannot be said for a crystal-controlled oscillator, as I found when I tried to frequency modulate the 8 mc crystal oscillator in my existing two-meter exciter. All the standard reactance-tube and varactor circuits were tried but none resulted in enough frequency deviation at 144 mc.

The trouble with varactors seemed to stem from too much r.f. voltage swing across the diode. At the time I was using a vacuum-tube crystal oscillator which developed about 40 volts of r.f. across the crystal. The effective capacitance of the varactor was therefore the average value over a very wide voltage range, and this average could not be changed much by changing the varactor bias.

The reactance tube circuits tried gave some frequency deviation, but not enough without resorting to very high-transconductance reactance tubes.

Probably the easiest way to go crystal-controlled n.b.f.m. on 144 mc and higher is by means of a phase modulator. Only a small phase shift is required—a mere ±32° phase shift at 8 mc will produce ±3 kc deviation when multiplied up to 144 mc[6]. A simple *R-C* integrating network, between the speech amplifier and phase modulator will change the p.m. to f.m. About the only disadvantage of a phase modulator is that it is not possible to measure frequency deviation directly by applying a variable d.c. voltage to the modulator—as can be done with most frequency modulators. For the same reason linearity is not easy to check.

An FET FM VFO/VXO

Before resorting to phase modulation, however, I came up with the crystal oscillator circuits of fig. 2 and fig. 3, both of which produce f.m. directly with ample deviation at 2 meters and higher.

Figure 2 is the v.f.o./vxo currently being used in the exciter part of my 144/432/1296 mc transmitter. F.m. is produced by adding a small audio voltage in series with the gate-return resistor of the 2N3819 fet oscillator. With the deviation set at maximum there is sufficient frequency swing for all but the very broadest two-meter receivers.

The tuned circuit across the crystal makes it possible to "vxo" the crystal frequency up or down. Some rocks can be "pulled" much farther than others; the amount of possible QSY is usually a minimum for the old-fashioned FT-243 and CR1A/AR type crystals and a maximum

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[6] For a 300 c.p.s. modulating frequency. At higher voice frequencies the necessary phase shift will be proportionately less — a requirement automatically taken care of by the integrating network.

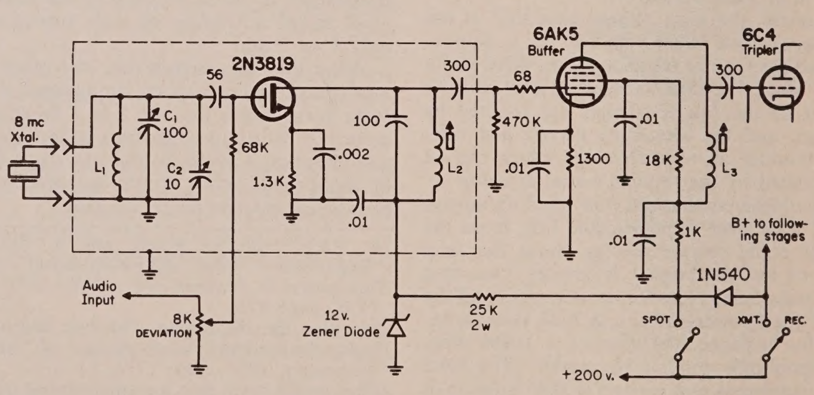

Fig. 2—A combination VXO/v.f.o. with f.m. capability for two-meters and higher.

L_1—10t. #16 on 1½" dia. ceramic form, space over 1½".

L_2—26t. #30 e. on 1/4" dia. slug-tuned form.

L_3—43t. #30 e. on National XR-50 form.

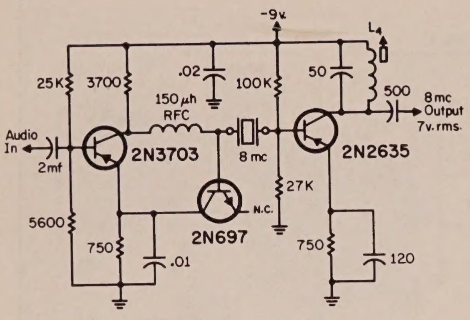

Fig. 3 — This f.m. crystal oscillator circuit is capable of somewhat more frequency deviation than that of fig. 2, but does not have the VXO feature. The 2N697 collector-based junction is used as a varactor. L_4 is 24t. #21 e. on a National XR-50 form.

for the small HC6/U types. I have one HC6/U 8 mc crystal which can be moved more than 400 kc at two meters! The FT-243 types average about 30 kc (90 kc at 432), but there is a wide spread between crystals. The amount of frequency deviation is proportional to the amount of possible QSY, of course, and the deviation control should be readjusted when crystals are changed.

By simply removing the crystal from its socket the oscillator is automatically converted to a v.f.o., frequency is then determined by the 8 mc tank circuit consisting of L_1, C_1 and C_2. As with any v.f.o. the oscillator circuit should be completely shielded and all components rigidly mounted. Temperature compensation would also be a good idea. With proper care the v.f.o. stability will be good enough for casual phone contacts. For c.w. or DX contacts I would recommend crystal control. Of course, as a self-excited oscillator the frequency deviation will be greatly increased and the deviation control must be turned down close to minimum to avoid very wide-band f.m.

As the output of the fet oscillator is not sufficient to drive a tube-type frequency multiplier directly, the output is amplified by the 6AK5 buffer-amplifier. The 6AK5 delivers more than enough drive for a 6C4 tripler to 24 mc.

Speech Amplifier

Speech processing should be used at the transmitter to realize the full benefits of f.m. Clipping and filtering can boost the detected signal-to-noise ratio many db without increasing the transmitted signal bandwidth.

The speech amplifier and clipper-filter I am using is shown in fig. 4. Q_1 and Q_2 make up a conventional direct-coupled microphone amplifier, and Q_3 acts as the clipper. Bias on Q_3 is adjusted so that positive and negative peaks are clipped at the same amplitude. Practically any two-for-a-nickle pnp germanium audio transistors can be used in this circuit. Gain is about right for a 50K ohm dynamic microphone, and so I did not include a gain control. Clipping can be increased by talking closer to the microphone. The output of Q_3 is filtered by a conventional low-pass *L-C* filter with a cut-off in the vicinity of 3 kc. The 56 mmf bypasses on Q_1 and Q_3 are to prevent a change in bias levels due to rectification of stray r.f. pickup.

Results

F.m. has been used at W6HPH for many months and much on-the-air experience gained with both local and DX contacts. The most significant finding is that anything that could previously be worked on a.m. can still be worked with the same power on f.m. The signal has been slope-detected by just about every type of receiver currently in use, from the very broadest down to s.s.b. sharpness.[7] I've even been successfully copied on an s.s.b. transceiver which had no provision for a.m. reception. It is sometimes necessary to readjust the deviation control to suit the receiver's band-width. The control is provided with a numerical scale which can be read out as it is run up and down; this permits the other operator to say just where it should be set for his particular receiver.

The fet oscillator is much more stable and drift-free than the tube oscillator it replaced—a very welcome improvement, especially at 1296 mc.

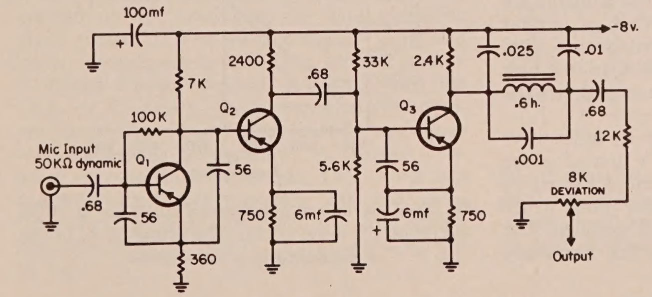

Fig. 4 — A simple speech amplifier and clipper-filter circuit.

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[7] To date I haven't worked any super-regens such as the "Twoer." It's doubtful that such a broad receiver could demodulate f.m.

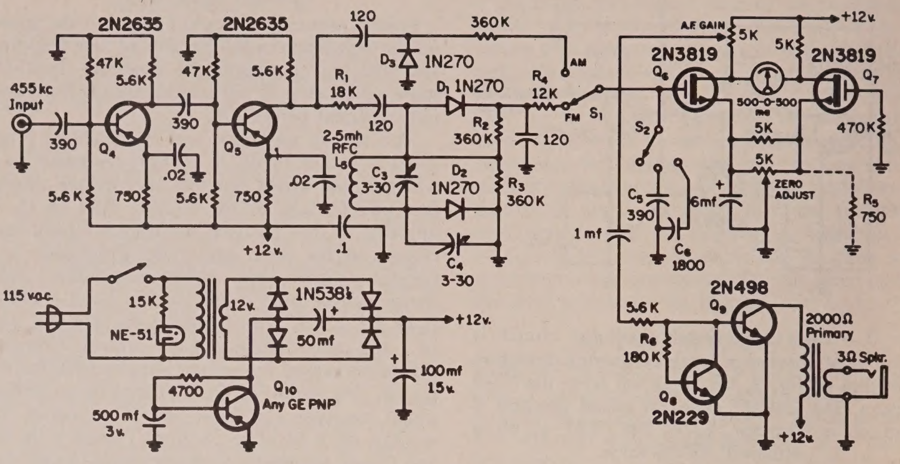

2N2635
2N2635
455 kc Input
390
47K
5.6K
390
Q4
.02
5.6K
750
47K
5.6K
Q5
5.6K
750
+12 v.
120
R1 18K
120
2.5mh RFC
L5
.02
C3 3-30
.1
D3 1N270
D1 1N270
360K
R2 360K
D2 1N270
R3 360K
C4 3-30
R4 12K
AM
FM
S1
120
A.F. GAIN
5K
5K
+12v.
2N3819
Q6
2N3819
Q7
500-0-500 ma
5K
5K
ZERO ADJUST
470K
R5 750
S2
C5 390
6mf
1 mf
C6 1800
2N498
Q9
5.6K
R6 180K
Q8
2N229
2000Ω Primary
3Ω Spkr.
+12v.
115 v.a.c.
15K
NE-51
12v.
1N538
50mf
+12v.
100mf 15v.
4700
Q10 Any GE PNP
500mf 3v.

Fig. 5—This simple 455 kc f.m. receiving adapter uses no hard-to-find discriminaor transformer or specialized components, and can be aligned without special equipment.

An FM Receiving Adaptor

For best possible signal-to-noise ratio f.m. should be detected with a frequency discriminator. The discriminator is usually preceded by an amplitude limiter which is useful for equalizing the amplitude of strong and weak signals, but contrary to popular belief the limiter does nothing for signal-to-noise ratio. A good discriminator, on the other hand, will make a noticeable improvement in readability over slope-detection.

Possibly one deterrent to the construction of f.m. receiving adaptors has been that most of the circuits require a special discriminator transformer or some other specialized component not generally found in the average ham's junk box. In addition, these circuits usually require a sweep generator and oscilloscope to be properly aligned.

The circuit of fig. 5 does not require a discriminator transformer; in fact only one inductance is used—an ordinary 2.5 mh r.f. choke. Moreover, the circuit can be aligned without specialized instruments; a fair job can even be done with nothing more than a received signal. This discriminator has a further advantage in that the band-width can be controlled over a wide range; it can be squeezed down to n.b.f.m. standards, or broadened out wide enough to even accommodate broadcast f.m.!

The principle of operation is as follows: A 455 kc signal from the receiver's first i.f. stage or mixer is amplified by Q_4 and delivered to the limiter, Q_5. For simplicity and broad bandwidth both of these stages are *R-C* coupled. The *R-C* values were chosen for a flat frequency response in the neighborhood of 455 kc and a roll-off in gain both above and below 455. Old timers will remember the Frank Jones *R-C* superhet of the 1930's which used no tuned circuits at all in the i.f. strip.

The f.m. signal from Q_5 is demodulated by diodes D_1 and D_2. The parallel tuned circuit, C_3-L_5, is adjusted to resonate at a frequency slightly above 455 kc. At resonance C_3-L_5 is essentially an open circuit and the signal is rectified almost entirely by D_1. Slightly below 455 kc C_3-L_5 becomes inductively reactive, and at some frequency will be *series* resonant with C_4. At such a frequency a large i.f. voltage will be developed across C_4 and will be rectified by D_2. The rectified i.f. voltage from D_1 is developed across R_2 and that from D_2 across R_3. These two voltages are equal and opposite and

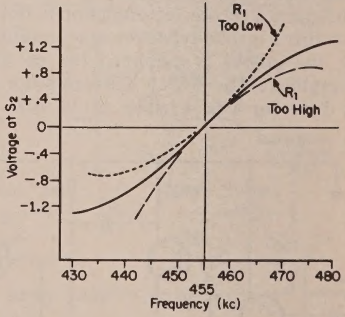
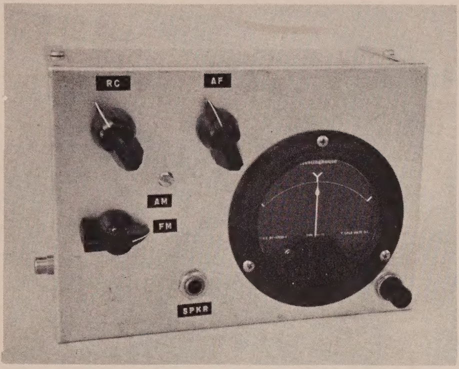


Fig. 6—Discriminator response curve for a 1000 microvolt i.f. input signal. The effect of R_1 in fig. 5 on linearity is also shown.



The f.m. receiving adapter is built in a 5 × 7 × 3 inch chassis-box. Only one connection to the communications receiver is required. Controls at the top are, left, Deemphasis (S_2, marked "RC"), and right, A. F. Gain. Below the deemphasis switch is the a.m./f.m. selector. A small neon pilot light is at the lower right of the meter.

will cancel at exactly 455 kc. Below 455 the voltage from D_2 predominates, giving a net negative output at S_1; above 455 the rectified signal from D_1 predominates, giving a positive d.c. output. The result is the familiar S-shaped discriminator curve of fig. 6.

For good linearity the discriminator must be driven from a source of correct impedance. In this case the source is Q_5, and its output impedance is increased by the series resistor, R_1. The effect of this resistance value on linearity is also shown in fig. 6.

Output from the discriminator is d.c. coupled to the fet differential amplifier, Q_6 and Q_7. This amplifier drives the zero-center micro-ammeter which serves as a tuning indicator. Transistor Q_6 also acts as an audio amplifier for driving the output stage, Q_9.

An adjustable de-emphasis circuit consisting of R_4, C_5, C_6, and S_2 is included so the adaptor will accommodate the different types of pre-emphasis currently in use.

The class-A audio output stage is somewhat unusual in the means of temperature compensation employed. Q_9 is a silicon transistor and is temperature compensated by the inexpensive germanium npn transistor, Q_8. This technique gives greater power output, higher gain, and better compensation than the more common 3-resistor biasing method. Actually, with the value of R_6 shown, Q_9 is somewhat over-compensated; that is, collector current *decreases* with increasing temperature; so thermal runaway is completely impossible. The 2N498 is a somewhat expensive transistor (this one came from the junk box) but practically any silicon npn type of more than 1/2 watt dissipation can be used.

An a.m. detector is also included in the adaptor, and can be switched in by S_1. A.m. signals are detected by diode D_3 which is driven by the limiter, Q_5. When receiving a.m. it is necessary to carefully adjust the receiver r.f. gain control so that limiting does not occur at less than 100% modulation. I included the a.m. detector mainly to see how effective Q_5 would be at limiting impulse noise and radar. The a.m. position gives a broader passband than is available in the receiver proper, which means shorter radar and ignition pulses.

Coupling Out of the Receiver

Unlike a.m., receiver bandwidth is an important factor in determining signal-to-noise ratio of the detected f.m. signal. The pre-detection bandwidth should be no wider than just sufficient to pass the f.m. sidebands. Since different frequency deviations are currently in use, the ideal f.m. receiver would be continuously adjustable in bandwidth from about 6 kc, for n.b.f.m.; to about 30 kc, for the 36F3 wideband f.m. signals. Such an ideal arrangement is simply not available in the average receiver, although a *Q*-multiplier could probably be built to handle this range of bandwidths.[8] For the average ham a fair compromise is a fixed-passband receiver of about 6 to 10 kc bandwidth. This will give a good S/N ratio on n.b.f.m. signals, and the wideband 36F3 signals will be partly readable with considerable distortion. The latter stations, however, can always be requested to turn down their deviation.

The i.f. signal should be taken from some point in the receiver's i.f. amplifier where the passband has not yet become too narrow. A convenient method of taking the i.f. signal from the receiver is shown in fig. 7.

The coupling capacitor, C_0, (about 20 to 50 mmf) is small enough that the i.f. transformer primary can be re-tuned to resonance with the capacitor shunting it. When nothing is plugged into the closed-circuit phone jack, it is a short

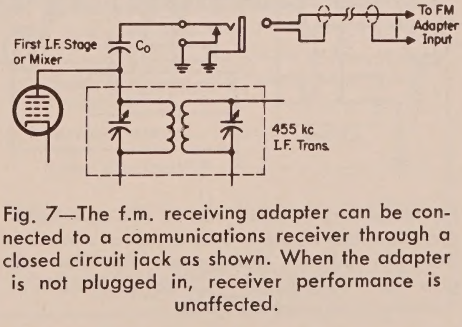


Fig. 7—The f.m. receiving adapter can be connected to a communications receiver through a closed circuit jack as shown. When the adapter is not plugged in, receiver performance is unaffected.

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[8] The *Q*-multiplier has poor skirt selectivity, but this is not a consideration in determining S/N ratio because skirts have very little influence on noise bandwidth.

circuit, and the receiver works exactly as it did originally, assuming the transformer primary has been re-tuned to resonance. It's important that the lead from C_0 to the plate be kept short and the physical size of C_0 be small to avoid feedback. The other lead is essentially grounded and can be as long as necessary.

The f.m. adaptor plugs into the phone jack through a short piece of coax or shielded wire. With the adaptor plugged in, its input impedance (shunted by the coax capacitance) is in series with C_0. Since this impedance is low, less than 1000 ohms, C_0 is still essentially resonating the transformer primary; but the transformer Q has been lowered, and the bandwidth broadened, by the resistive component of the adaptor input impedance.

Normally, the i.f. signal will be taken from the first i.f. stage plate, as shown in fig. 7. If there is only one i.f. transformer between the mixer and first i.f. stage, it can be somewhat broadened by slightly stagger tuning. Alternatively, it can be replaced with an *output* i.f. transformer of the type used between the last i.f. stage and second detector of a tube-type a.m. BC radio. Usually output i.f. transformers have a greater coefficient of coupling and consequently a broader bandwidth than interstage types.

Where there is a fixed narrow-bandpass filter between the mixer and i.f. signal directly from the mixer plate in order to get enough bandwidth. In such a case there will be only one tuned circuit involved (the first i.f. transformer primary) before the discriminator and skirt selectivity will be inadequate. In this event it would be appropriate to use one or more transistor i.f. transformers as interstage coupling between Q_4 and Q_5. A two transformer circuit is shown in fig. 8.

Adjustment

Initial adjustment of the f.m. adaptor is quite simple. First of all, the tuning meter should be centered on zero. If the meter does not adjust to center with the 5K ohm zero-adjustment pot, it probably is because the 2N3819's are poorly matched. In this event the difference amplifier can be balanced with a 750 ohm resistor (R_5 in fig. 5) from emitter to ground of either Q_6 or Q_7, depending on which is drawing the smaller current.

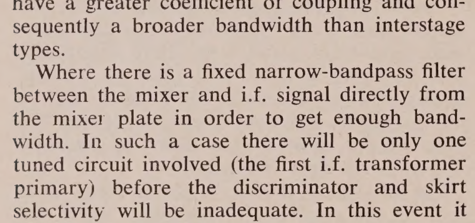
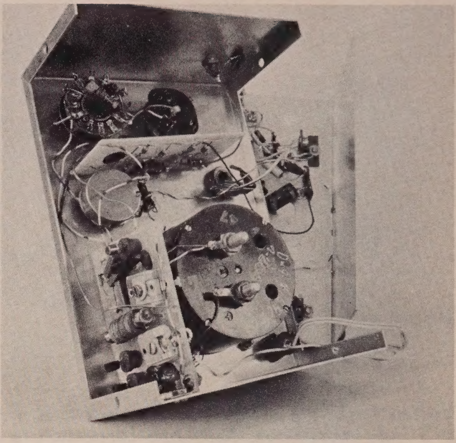


Fig. 8—A very compact 455 kc two-pole bandpass filter can be made from a pair of miniature transistor radio i.f. transformers. This filter will give the f.m. adapter a 3 db bandwidth of about 10 kc.



Interior view of the f.m. adapter. All components except those associated with the power supply and audio output stage are mounted in the front half of the box.

With the meter properly centered, insert a 455 kc signal from either a signal generator or your receiver into the adaptor input. Set C_4 to about 1/4 of maximum capacity and tune C_3 while watching the meter. It should swing first one way, and then through zero to the opposite extreme as C_3 is tuned through resonance. C_3 should be left set where the meter reads zero for an input frequency that has been carefully centered in the receiver's passband.

You can check linearity by measuring the d.c. voltage at S_2 with a v.t.v.m. A plot of voltage vs. frequency should look like fig. 6. Some readjustment of C_3 and C_4 (they interact) may be necessary for good symmetry.

C_4 controls the bandwidth, and it is better to have too much discriminator bandwidth than too little. The over-all response will then be determined by the i.f. tuned circuits ahead of the discriminator.[1] ■

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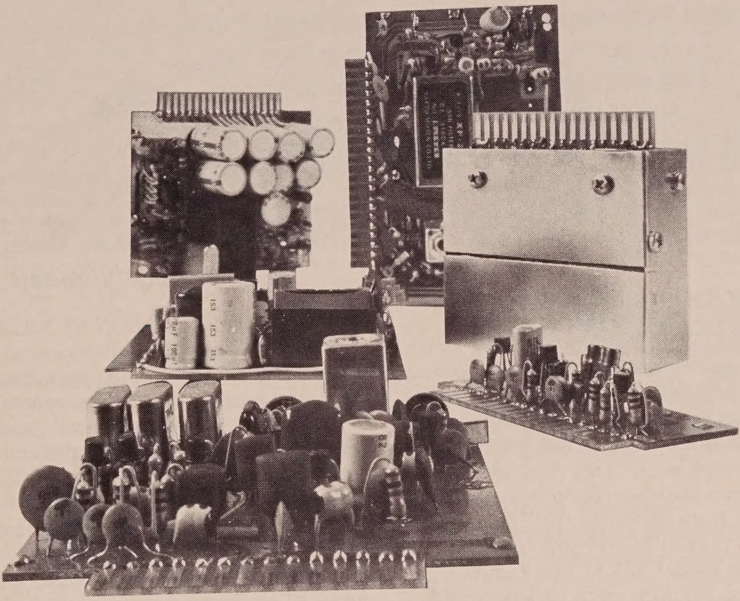

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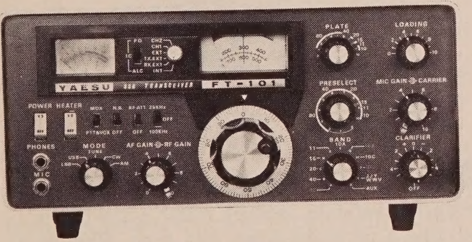

Not to mention a built-in 12 VDC and 117 VAC power supply. Plus an in-motion necessity — a noise blanker that picks out noise spikes, leaving only clean noise-free signal copy behind.

The FT-101 is a thirty-pound package of DX punch, air-ready when you are, wherever you are. Just add an antenna, feed it 12 or 117 volts, and you're ready to work the world.

So sure are we of the 101's solid-state reliability, we guarantee it for one year from date of purchase. And we guarantee you that it will be a very good year . . . the first of many to come. The FT-101 — only $499.95.

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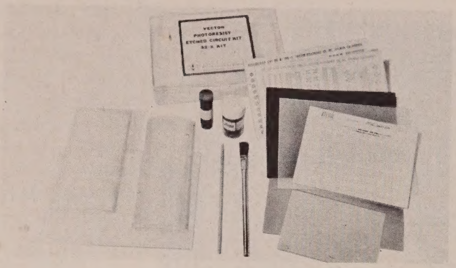
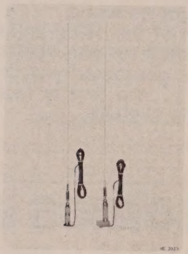
New Amateur Products



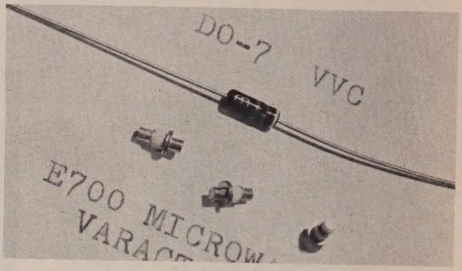
Vector Positive Photo Resist Kit

VECTOR Electronics announces the availability of 2 new etched circuit kits. According to the manufacturer, these kits are different in the respect that they make use of easy-to-make positive art work, much of which is pre-printed and in the kits, plus photo sensitized copper clad boards in various sizes. Kits sell for from $8.95 for the 32X sampler assortment to $24.95 for the professional sized version model 32XA. For complete information on the kits write to Vector Electronic Co., 12460 Gladstone Ave., Sylmar, California 91342 or circle 80 on Reader Service coupon.



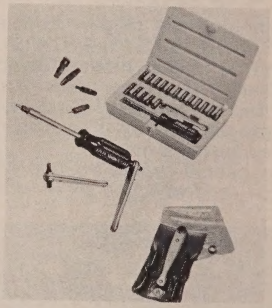
Hustler 2 Meter Mobile Antennas

SPECIFICALLY engineered for amateur application, the models BBL-144 (permanent body mount) and BBLT-144 (no hole trunk lip mount) are two meter power gain antennas optimized for maximum gain, quick installation and rugged maintenance free operation. Both series are designed to handle 150 watts f.m., s.s.b., and c.w. or 100 watts on a.m. For complete details write to Sales Dept., New-Tronics Corp., 15800 Commerce Park Drive, Brookpark, Ohio 44142 or circle 81 on Reader Service coupon.



Eastron Corp. Varactors

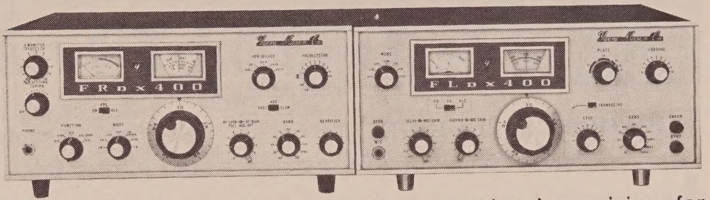
A NEW family of high Q varactors for applications from i.f. frequencies up through 450 mc is available from Eastron Corp. Amateur uses include a.f.c., incremental tuning of transceivers, remote control, and simplified frequency modulation. Application notes and data sheets are available from the manufacturer. Prices range from $1.50 to $6.50 in small quantities. Delivery from stock. For further information write to Eastron Corp., 25 Locust St., Haverhill, Mass. 01830 or circle 82 on Reader Service coupon.



Xcelite Reversible Ratchet and Scewdriver Set

XCELITE is now offering a new 19-piece, midget reversible ratchet offset screwdriver set which includes Allen hex type, Phillips, and slotted screwdrivers. The No. XL-70 set includes a 3¾″ heavy duty, stainless steel reversible 20-tooth ratcheting handle with a turning radius of 18°, and a 6″ spinner/extension handle. A smaller 5-piece set, the XL-75, is also available. Complete data on both sets may be had by writing Xcelite Inc., Orchard Park, New York 14127 or circling 83 on Reader Service coupon.

Now you don't have to pay twice the price to get twice the rig.



Picture this pair in your shack. The Yaesu FLdx 400 transmitter and the FRdx 400 receiver. Loaded with power. Loaded with sensitivity. Loaded with features. Loaded with value. Read on, and discover how you can have the most up-to-date receiver-transmitter rig in the world . . . and at an unbelievably low price.

The FRdx 400 Receiver

Get a big ear on the world with complete amateur band coverage from 160 meters through 2 meters, including WWV and CB reception. Four mechanical filters do it — they provide CW, SSB, AM and FM selectivity. Separate AM-SSB-FM detectors are included, along with squelch and transmit monitor controls. Plus a noise limiter and a variable delay AGC. And a built-in notch filter with front panel adjust for notch depth.

The FRdx includes calibration markers at 100 KHz and 25 KHz, with accurate calibrator checks verified by WWV. A solid-state FET VFO for unshakable stability. And a direct-reading 1 KHz dial affords frequency read-out to less than 200 Hertz.

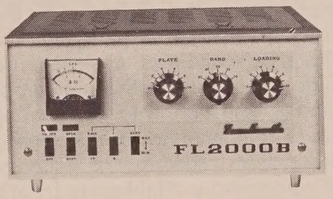
The FRdx 400 sells for $359.95.

The FLdx 400 Transmitter

Here's how to set yourself up with dual receive, transceive or split VFO operation. The FLdx 400 with its companion receiver brings you the ultimate in operational flexibility. Flexibility like frequency spotting, VOX, break-in CW, SSB, AM and even an optional FSK circuit.

The completely self-contained FLdx 400 features a built-in power supply, fully adjustable VOX, a mechanical SSB filter, metered ALC, IC and PO. A completely solid-state FET VFO provides rock-solid frequency stability.

We rate the FLdx 400 very conservatively. That rating guarantees you 240 W PEP input SSB, 120 W CW and 75 W AM. The FSK option will go all day at a continuous 75 W. And you get full frequency coverage on all amateur bands — 80 meters through 10 meters — with an optional provision for certain other bands that you can personally specify. For all that, you pay just $299.95.



FL2000 B Linear Amplifier.

Ideal companion to the Series 400, this hand-crafted linear is another example of Yaesu's unbeatable combination of high quality and low cost. Designed to operate at 1500 watts PEP SSB and 1000 watts CW, this unit provides superb regulation — achieved by a filter system with 28 UF effective capacity.

Other features include dual cooling fans (one for each tube), individual tuned input coils on each band for maximum efficiency and low distortion, and a final amplifier of the grounded grid type using two rugged carbon-plate 572 B tubes. Ready to operate at only $299.95.

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F.M.

BY GLEN E. ZOOK,* K9STH/5

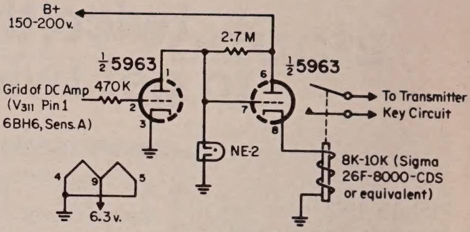

Fig. 1—A carrier operated relay.

LAST month I promised to reveal a new source of obsolete commercial f.m. equipment. Well, that source is Motorola Communications & Electronics, Inc., Area IV. Several times a year a list is sent out by the Reconditioned Equipment Department. This list gives the price, condition, and other needed information about the individual equipment available for distribution to amateurs. Since the types of equipment available is dependent upon equipment traded-in, the quantity and types of equipment available vary from list to list. The equipment is sold basically on an "as-is" basis with return priviledges for extremely damaged equipment (freight prepaid). However, the equipment is priced lower than many other sources and is usually in good or better shape. This equipment was operating (supposedly) when traded-in and has not been touched since. Certain types of equipment are also sold reconditioned, on-frequency, with a one-year warranty on parts. This equipment is listed with the "as-is" equipment and designated as available Reconditioned.

How do you get on the mailing list? These lists are mailed to one representative from each amateur radio club, repeater organization, or similar group who request the list. The proper method of being placed on this list is to mail (UNDER NO CIRCUMSTANCES TELEPHONE) a letter with the following information:

Name of club or organization
Name or representative
Amateur Call sign of representative
(must have call)
Mailing address

Mail this letter to:

Motorola Communications & Electronics, Inc.
3320 Belt Line Road
Dallas, Texas 75234
Attn: Reconditioned Equipment Department

Again let me emphasize not to telephone Motorola concerning any type of amateur radio equipment. The sale of this equipment is not a money making endeavor to any great extent. If sufficient cause is given, such as the tying up of individual employees in answering questions about amateur equipment the program will be stopped with no one but the amateur FM'er losing. Although the lists are mailed to club representatives, any licensed amateur can purchase the equipment. The requirements are as follows:

1. Each order must be accompanied by a photo-copy of the individual's amateur license.
2. Each order must be accompanied by a signed statement to the effect that the equipment purchased will be used only for amateur radio purposes and will not be used in or resold into commercial service.
3. A check or money order for the total amount (Texas residents add 4.25% sales tax). This check will be returned if the equipment type has been sold out prior to receipt or order.
4. All shipments will be made freight

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---

*818 Brentwood Lane, Richardson, Texas 75080.

For $450, you just can't beat the Yaesu FTdx 560.

You can't even beat it for $800.

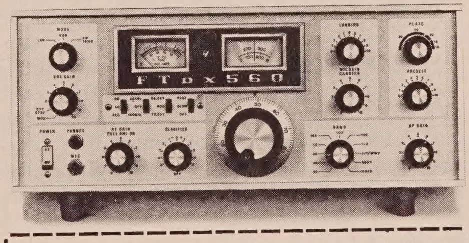
How come the Yaesu is such a good deal?

First of all, it's made in Japan, where people do painstaking electronic assembly work for a lot less money than they do in the U.S. Secondly, it's probably the highest quality transceiver made anywhere in the world, regardless of cost.

Also we import the Yaesu and sell it direct to you, eliminating the usual dealer profit.

The Yaesu FTdx 560 is a fully assembled, fully guaranteed transceiver with 560 watts PEP of SSB power, 500 CW. Included in the selling price are many of the things you usually have to pay extra for. Like power supply, WWV, calibrators, VOX and the one-year warranty. And a lot more.

To see how much more you get with Yaesu, send for our new information packet. It includes things like a chart and photos that compare Yaesu and Yaesu workmanship with other transceivers, plus a complete schematic. Study this packet and you'll see right away how much more value there is in a Yaesu.



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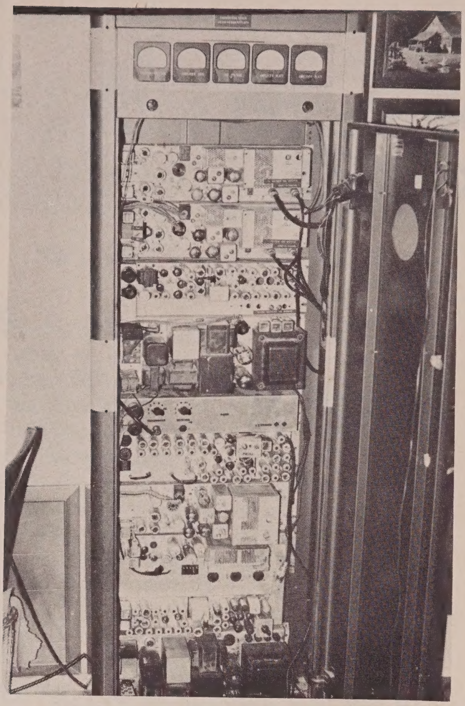
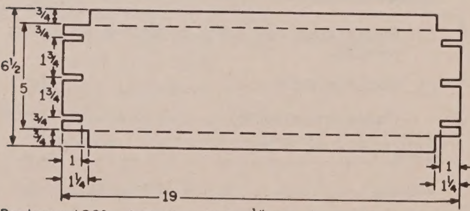


In case you're wondering what's in the rack.

charges collect. Under no circumstances will pick-ups be allowed.

You say that you don't have a local club or repeater group. We'll, this is as good an excuse as any to form one.

Those amateurs who know this columnist personally may take exception to my presenting the information about the disposal of obsolete Motorola f.m. equipment, since I am the President of the Corporation which subcontracts the warehousing and reconditioning of Motorola f.m. equipment for the South Central USA. However, the Corporation is paid for handling the equipment if it is destroyed just as well as when it is shipped to an amateur f.m.'er. Thus, I would rather see the equipment used for legitimate amateur f.m. use than watch a bulldozer run over it. However, if there is serious abuse of the priviledge either by annoying phone calls to either Motorola or to the Recon Center or by the resale of equipment into commercial service the sale of equipment to amateurs will cease.



Bend upward 90° on dotted lines. All slots $\frac{1}{4}$" wide x 1" long. All dims. in inches.

Fig. 2—Transmitter and receiver bottom plate.

Technical Talk

This month's technical talk is aimed at the f.m.'er who is looking for a simple method of establishing a repeater in his locality. The basic repeater described herein is promarily for two meter f.m. operation. However, by changing the transmitter and receiver strips the repeater can be made to operate on the other v.h.f. and u.h.f. amateur bands. This repeater is a plain vanilla set-up, consisting of a receiver, transmitter, interconnecting circuitry and provision for 2 wire control line. In the next several columns this basic repeater will be expanded to include the various niceties which may be desired. The strips and intercabling described are Motorola equipment. However, General Electric, RCA, Kaar, or other strips may be substituted by changing the appropriate voltage and power connections. Also, if the Motorola Sensicon "A" receiver is not used, an external cavity will have to be used to isolate the receiver from desensing from the transmitter.

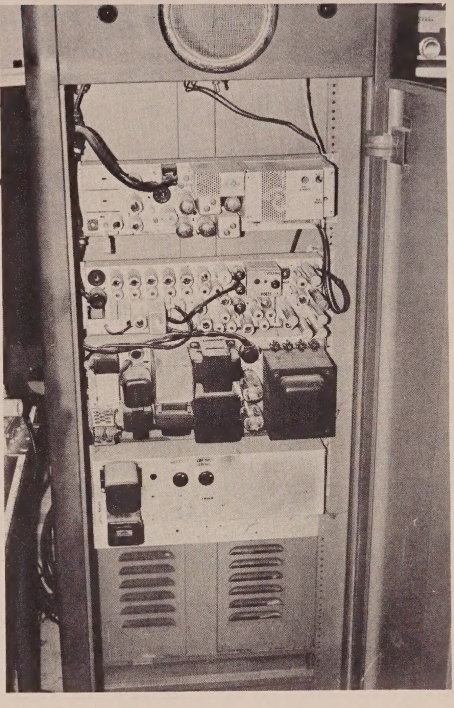
The strips used in this repeater are the Motorola Sensicon "A" receiver and either the 30 watt "A" or 60 watt "A" transmitter. These strips are used in the famous FMTRU 80D and FMTRU 140D series of equipment. These strips may be purchased from a number of commercial sources selling to amateurs. The Sensicon "A" receiver can be readily recognized by the 5 or 6 cavities in the front-end and mixer stages (see photograph). The 60 watt "A" transmitter uses an 829B final and the 30 watt "A" transmitter uses a pair of 2E26's.

The power supply requirements may be met by either the Motorola P8434 (30 watt Transmitter) or P8464 (60 watt transmitter) which will furnish proper voltages can also be used.

The construction of the repeater begins with the tuning up of both the transmitter and receiver for operation on the desired frequencies. Next a carrier operated relay (COR) should be attached to the receiver. The schematic of a suitable unit (similar to the Motorola TK 297) is in figure 1. This relay operates whenever the squelch of the receiver opens. When the squelch opens, the tube draws current through the coil of the relay, thus causing the contacts of the relay to close. When these contacts close, they activate the transmitter p.t.t. circuit.

The next step is to shield both the transmitter and receiver. The transmitter is shielded by the addition of a bottom plate either purchased or constructed from aluminum sheet (do not use steel). The dimensions for a suitable shield are in figure 2. This shield is installed from the rear of the rack after the transmitter has been mounted, thus allowing for the removal of the shield for service without disassembly of the repeater. A similar shield should be constructed for the receiver. Next all power leads must be by-passed. The commercial kits have a small box with power plugs to match the receiver and filtering components inside. A similar box can be constructed using an un-painted mini-box and suitable power connectors. Each lead except for the heater and ground connections should be filtered with an Ohmite Z144 r.f. choke in series and a 680 mmf capacitor to ground. The heater lead can be filtered with a coil of about 15 turns #14 enameled 1/4″ in diameter with a .001 mf capacitor to ground. The ground lead is not filtered. The entire receiver except for the filter box should then be encased in a case made from "cane" metal (aluminum with many holes punched in it). The antenna coax coming from the jack on the receiver chassis should have its shield connected to the cane metal shield at the point where it passes through. Since this is difficult to achieve a substitute can be made by installing a SO-239 jack with a hood directly on the cane metal shield and running a short piece of coax to the receiver antenna jack. The coax from the antenna is then connected to the SO-239 and can be attached and removed easily.

There are two basic methods of coupling the audio from the receiver into the transmitter. The method commonly used in commercial repeaters is transformer coupling. The remote chassis such as the Motorola P8066 series contain the transformers to properly match the receiver audio to the transmitter. Also, these panels allow priority control from a distant point by 2 wire line. The second method of coupling the audio into the transmitter is by use of a cathode follower. This method is not usually as good as the transformer method but is satisfactory.



Commercial repeater using strips described in text. Note COR on receiver.

The hookup for the P8066 appears as figure 3 and the schematic for a cathode follower appears as figure 4.

When racking up the repeater place the power supply on the bottom (for stability) with the receiver next, the audio coupling next, and finally the transmitter on top. The

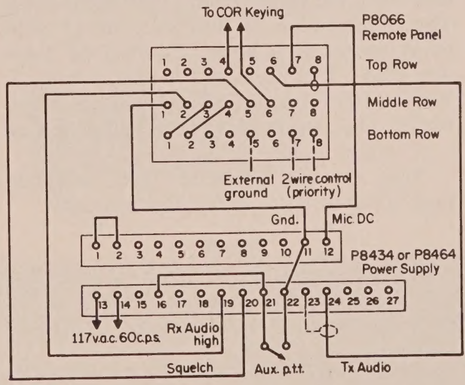


Fig. 3—Intercabling for remote panel coupling.

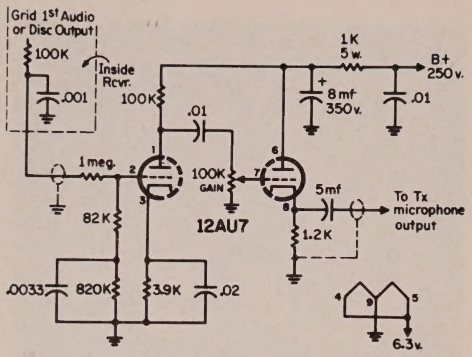


Fig. 4—Cathode coupling for audio coupling.

repeater in the photograph has operated for many years with the receiver next to the transmitter, but the further the receiver from the transmitter the better.

When installing the repeater place the receiving antenna as far above the transmitting antenna as possible, while giving satisfactory transmitting range. This is to reduce receiver desensing. Vertical separation does much more to reduce desensing than does horizontal separation. Use the best coax or heliax available. Take into consideration the losses at v.h.f. and u.h.f.

If serious receiver desensing takes place, it will be necessary to install cavities in both the receiver and transmitter antenna feed lines[1]. Such cavities are available commercially (for a small fortune) or may be built by the f.m.'er. Details for such a cavity may be found in both the *Radio Amateur's Handbook* published by the ARRL and the *VHF-UHF Manual* published by the RSGB.

Please do not contact Motorola for information on the strips which I have mentioned. This information is available, along with many others, in a book published by Two-way Radio Engineers and available from S. Wolf, 1100 Tremont Street, Boston, Mass. 02120. The price is $6.50 post-paid (free plug ...I bought mine).

Next month's Technical Talk will add time-out and radio control link circuitry.

News

News from outside the South Central USA is still scarce. How about it f.m.'ers. In regards to the never ending battle of channel assignments for 2 meter repeaters: The feelings around Texans lean towards the following, so lets hear from other parts of the country.

Input	Output	Comments
146.370	146.970	
146.340	146.940	National Frequency
146.310	146.910	
146.280	146.880	
146.250	146.850	
146.220	146.820	
146.190	146.790	
146.160	146.760	Now used as .34/.76 in areas
146.130	146.730	
	146.700	FM AFSK RTTY
146.070	146.670	
	146.640	Point to point & DX Chasing
146.010	146.610	

Questions

Q. My Galaxy FM 210 does not seem to have the sensitivity as do older tube type sets used by my friends. What are the possible causes?

A. In looking at the Galaxy tune-up instructions you will find several stages which require the use of a sweep generator to keep a wide bandwidth. In areas where narrowband (±5 KHz) or "Bellyband" (±7.5 KHz) deviation are used substantial gain may be realized by peaking these circuits as well as those circuits previously peaked. This resulted in an improvement of about 10 db in a trial unit. Also, the replacement of the JFET transistors with the Texas Instruments TIS88/2N5245 series helped about 6 db. By the way, the receiver with the peaked stages had an improved adjacent channel rejection (60 kc away) of about 20 db more than before peaking.

Q. I recently purchased commercial quality crystals for my f.m. receiver. However, the crystal will not oscillate. Why?

A. In most cases the front-ends of obsolete commercial receivers will tune to the amateur band adjacent to it (such as 30-40 mc tuning to 10M, 40-50 mc to 6 M, 152-172 mc to 2M, etc.) However, the crystal oscillator coil-capacitor combination is at a lower frequency range in many cases and thus does not have as great a possible tuning range. Thus, the crystal frequency for the amateur band is often outside the normal tuning range. The

[*Continued on page 78*]

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[1] Gibson, "Two Gallon 50 mc Cavity," *CQ*, June, 1970, p. 23.
Carr, "A Two Meter Cavity Filter," *CQ*, July/-Aug., 1970, p. 62.

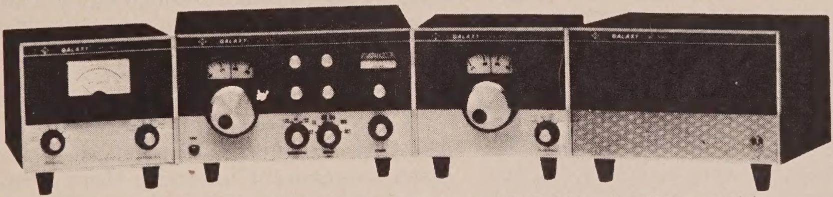
A GREAT BUY FROM ARROW —

HY-GAIN'S GALAXY LINE

A Complete Amateur Radio Line of Transceivers and Accessories

In order to provide a complete range of equipment for discriminating Amateurs, Hy-Gain Electronics Corporation has acquired all stocks and production facilities of Galaxy Electronics. Now *all* the best distributors under the sun can offer you Hy-Gain's complete line of antennas *plus* Hy-Gain's Galaxy Line of transceivers and accessories. And, now that traditional Hy-Gain and Galaxy quality have been combined, you can look forward to even more outstanding products in the future!

Hy-Gain's Galaxy GT550 Transceiver and Matched Accessories



GT550 Transceiver offers *top* performance—550 watts SSB, 360 watts CW; sensitivity better than ½ uv for 10 db S+N/N ratio. Stable—45 db carrier suppression.
Order No. 800 Price **$550.00**

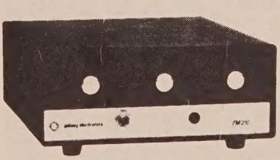
RF550 contains high accuracy watt meter; calibrated scales; switch for forward or selected power; switch to select 5 antennas or dummy load.
Order No. 805 Price **$ 75.00**

RV550 is a solid state VFO. Function switch selects the remote unit to control Receive-Transceive-Transmit frequency independently.
Order No. 804 Price **$ 95.00**

SC550 Speaker Console with headphone jack for GT550 transceiver. AC400 power supply will mount inside console.
Order No. 803 Price **$ 29.95**

AC400 Power Supply is a heavy duty solid state supply to operate the GT550 at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Wires cable/plug for the GT550.
Order No. 801 Price **$ 99.95**

Hy-Gain's
Galaxy FM-210 2 Meter FM Transceiver



This American-made, solid state, FET front end wide band FM transceiver offers no compromise performance for direct or repeater communications...a full 10 watts of power.
Order No. 813 Price **$229.50**

Many more accessories are available.

Dept. D

ARROW ELECTRONICS, INC.

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203 838-4877

97 Chambers St., N. Y., N. Y.
212 DIgby 9-4411

525 Jericho Tpke., Mineola, N. Y.
516 PIoneer 2-2290

225 Rte. 46, Totowa, N. J.
201 256-8555

900 Rte. 110, Farmingdale, N. Y.
516 MYrtle 4-6822

195 W. Route 59, Nanuet, N. Y.
914 623-6444

207-02 Northern Blvd., Bayside, N. Y.
212 423-0910

Calibrating F.M. Deviation

BY CURT GREY,* VE2AQX

THERE has been a considerable number of commercial f.m. radios (transceivers) being put on the market during the last few years. The prices are very good and the units seem to be the right thing for local nets, etc.

There is one minor (or major) problem, however, and that is how to set the modulation accurately. Usually the equipment required is elaborate and expensive. But all this test gear is built not only for accuracy, it is also built for speedy service. The system described here is not speedy, but it is very accurate. In fact, an accuracy of 2% is obtainable.

The equipment required for this test is as follows: an oscilloscope, an accurate a.f. oscillator, the station receiver and an a.c. voltmeter.

The scope serves only as an indicator and it should have fairly good sensitivity. The signals displayed will be the i.f. of the monitor system (station receiver), which in most cases is close to 455 kc.

The audio oscilloscope must have output anywhere from 400 c.p.s. to 1000 c.p.s. The frequency from this oscilloscope must be known very accurately with preference given to 440 c.p.s. and 1000 c.p.s., because those frequencies can be monitored off the air from many stations. For example, 440 and 600 c.p.s. can be compared with WWV and I do not suggest to question the accuracy of that station, hi!

The station receiver need not have a b.f.o. The only criteria is stability. The receiver should stay on frequency.

The a.c. voltmeter must be capable of handling the i.f. of the receiver. This voltmeter is not an absolute requirement. The Heathkit IM-21 or the Hewlett Packard 400D (or the equivalent) will do nicely. This v.t.v.m. will measure the output from the vertical amplifier of the oscilloscope.

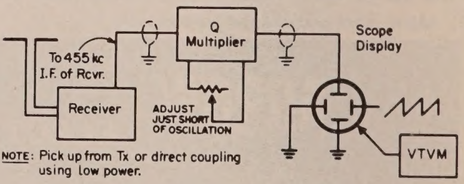
DANGER
HIGH VOLTAGE

The simple Q-multiplier of fig. 2 is shown connected to a Motorola Station Monitor through a BNC connector mounted close to an i.f. amplifier.

Test Procedure

The method described is known as "The Bessel Zero Method," and is related to the Bessel functions.[1] Fortunately, there is no knowledge required as far as Bessel functions are concerned. The test procedure is based on the fact that, at certain points which correspond to discrete modulation indices, the zero order function passes through zero.

It boils down to this: as a carrier is frequency modulated by a single frequency, the i.f. signal in the monitor receiver disappears at several points as the amplitude of the modulating signal is increased. These null points correspond to specific modulation indices, the first five of which are 2.4048, 5.5201, 8.6537, 11.7915 and 14.9309.



NOTE: Pick up from Tx or direct coupling using low power.

Fig. 1—Test set-up for measuring f.m. deviation.

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*95 Blouin, Sept Iles, Quebec, Canada.

[1] H. E. Harris, "Simplified Q-Multipliers," *Electronics,* May 1951, p. 130.
D. Henry, "Calibrating Broadcast Modulating Meters," *Electronics,* April 1960, p. 67.

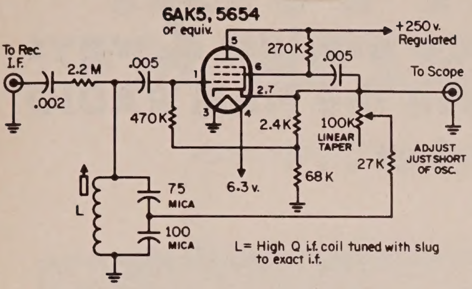


Fig. 2—Q-multiplier for modulation measurements on f.m. (p.m.) transmitters or signal generators.

The modulation index is the ratio of frequency deviation to modulation frequency. Out of this follows: knowing the indices at which the carrier is zero and also knowing the modulation frequency, the deviation at each carrier zero (null) is easily determined.

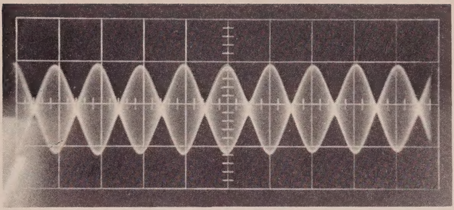
As example, let us take a modulation frequency of 1000 c.p.s. It must be pointed out again that this frequency must be known to be very accurate. Then the nulls will be obtained at the following frequencies: 2.4048 kc, 5.5201 kc, 8.6537 kc, 11.7915 kc and 14.9309 kc. Using a frequency of 600 c.p.s. a frequency that is transmitted by WWV, the nulls would be at 1.1443 kc, 3.312 kc, 5.192 kc, 7.075 kc, 8.958 kc.

In other words: modulating a transmitter with a frequency of 600 c.p.s. and increasing the level to the modulator stage slowly from zero level on up, one will observe the carrier to dissappear at a deviation of 1.433 kc (the first null). All the power is in the sidebands.

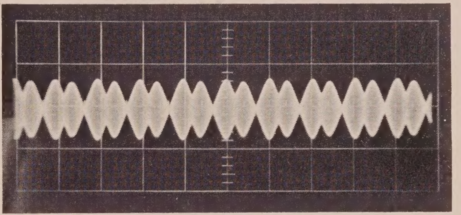
The accuracy of the test setup depends now on how accurately one can define the nulls. The set-up shown in fig. 1 was found to be the ideal method for hams to measure frequency deviation. The block diagram explains the set-up.

The Q-Multiplier

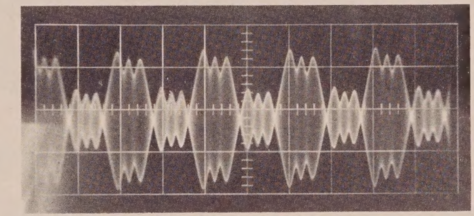
The main unit is the Q-Multiplier.[2] This unit operates at the i.f. of the monitor receiver. The Q of the coil must be good for best results. Otherwise the unit is straight forward. There is nothing critical about this Q-Multiplier. There are only two important points to consider: 1. The unit should be compact and well-shielded in order to control the feedback properly. 2, The power should come from a regulated supply. The supply. voltages could easily come from the receiver itself (the unit draws only a few milliamps). The Q-Multiplier is connected to the i.f. via a short cable. The connection should be done



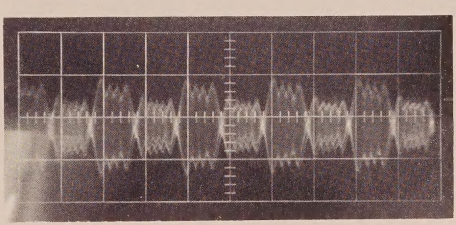
First null, 2.4048 kc.



Second null, 5.5201 kc.



Third null, 8.6537 kc.



Fourth null, 11.7915 kc.

Oscilloscope photos of nulls indicating f.m. deviation. The third and fourth photos are imperfect due to some power fluctuation. In these two photos, the null is not adjusted perfectly to demonstrate what an approaching null looks like. Modulation frequency is 1000 c.p.s.; time base: 0.5 ms/cm.

[*Continued on page 81*]

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[2] Of course, one may use any other Q-Multiplier. A Heathkit model HD-11 will do.

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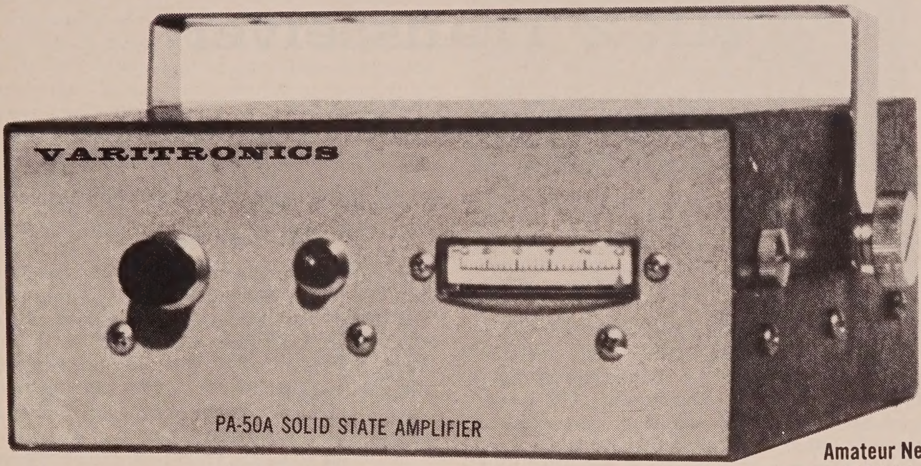

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CQ Reviews:

The Regency HR-2 Transceiver

BY GLEN E. ZOOK,* K9STH

The number of amateurs operating on v.h.f. f.m. in the United States and Canada has increased rapidly in the past few years. During most of this time operation has been with obsolete commercial units released from police, taxi, and other services. Within the past two years a number of solid-state v.h.f. f.m. units designed for use by the amateur radio operator have been introduced by manufacturers both foreign and domestic. The Regency HR-2 is a good example of the equipment being manufactured within the United States for the f.m. minded amateur. It is compact, versatile, and has sufficient power for most serious and all casual f.m. work.

General

The Regency HR-2 transceiver is designed for operation on the 2 meter (144-148 mc) amateur band. Both receive and transmit frequencies are crystal controlled on each channel. The receiver is a dual conversion superheterodyne with a ceramic filter for adjacent channel rejection. The transmitter utilizes phase modulation (as do most units for commercial use) with an output of 10 watts or more. The unit comes equipped with a mounting bracket for under-the-dash use and a length of cable for power application (12 volt negative ground). Accessories include a cigarette lighter plug (Regency MA-10, not supplied) for easy attachment to the automobile electrical system, and a good quality high-impedance ceramic microphone and connector (supplied).

The Regency HR-2 2-meter f.m. transceiver.

Technical Details

The HR-2 employs complete solid state circuitry, including the following:

Integrated Circuits	2
Silicon Transistors	21
Silicon Balanced Emitter Trans	2
Zener Diodes	2
Varicap Diodes	2
Small Signal Diodes	3
Field Effect Transistor	1
Total devices	33

Of these devices 13 transistors, 2 integrated circuits, and one zener diode are utilized in the receiver section. All remaining devices are used in the transmitting section.

Receiver

The receiver is a 6 channel crystal controlled superheterodyne dual conversion unit. Basic sensitivity for 20 db quieting is a claimed 0.35 microvolts nominal. Audio output at 4 ohms and 10% distortion is 3 watts, with a maximum output of 5 watts. All transistors and integrated circuits appear to be manufactured by Motorola, but some devices are marked only with a color-code. The color coding on these devices are similar to those on devices manufactured by Motorola and used in their own communications equipment.

The r.f. amplifier stage of the HR-2 receiver section is a bi-polar silicon transistor. This transistor has no JEDEC number stamped on it, only color coding. The 50 ohm input is matched through a tapped, slug-tuned coil. The signal is applied to the base of the r.f. amplifier through a second tuned stage. The output of the amplifier is then fed through 2 tuned circuits to the base of the mixer transistor, (apparently identical to the r.f. amplifier transistor, thus indicating a good, low noise, high frequency silicon transistor).

The oscillator section utilizes a 2N5130 as an overtone oscillator-multiplier. The crystals are 45 mc overtone types which are switched for channel selection. No provisions are made for warping or "rubbering" the receive crystals to

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*FM Editor, *CQ.*

frequency, so quality crystals matched to the receiver must be used to ensure on-channel operation. The output of the oscillator-multiplier stage is 10.7 mc lower in frequency than the desired received frequency. When this signal is applied to the 1st mixer the result is a 10.7 mc high i.f.

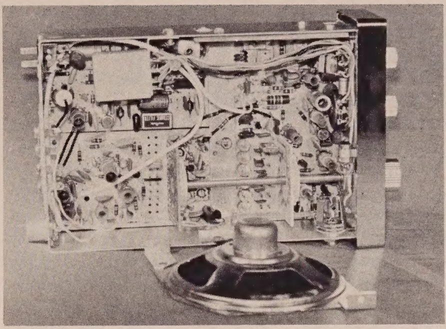
The output of the 1st mixer is applied through two transformers to the high i.f. amplifier, an MC1550G integrated circuit. This integrated circuit has the potential gain of at least 30 db power and a noise figure of less than 5 db[1] at 60 mc. The IC also contains the 2nd mixer stage. A 10.245 mc signal is applied from a transistorized, crystal controlled 2nd oscillator. The result is a 455 kc low i.f., which is the passed through a Japanese Murata ceramic filter to the second IC.

This second IC functions as a low i.f. amplifier, limiter, and detector. The IC is a 14 pin DIP type with no visible markings. Audio output is applied simultaneously to the audio amplifier and squelch stages, which operate on noise impulses. The audio output consists of three stages with capacitor coupling to an integrated 3.2 ohm 4 inch speaker. Provision is made for use of an external speaker if so desired.

Transmitter

The transmitter section of the HR-2 is a crystal controlled solid-state unit with an output of at least 10 watts. The crystals used have a tolerance of 0.0015% and may be set to frequency for on-frequency operation. Frequency multiplication is 24 times, which is achieved in the first five stages. The final transistor, a 2N5590 balanced emitter v.h.f. NPN silicon operates straight through. A high-s.w.r. protection circuit which senses reflected power is provided to prevent damage to the transmitter when operated with improper load. Circuitry is straight-forward.

The audio section of the transmitter uses a JFET as microphone pre-amplifier. Output from the preamp is fed through an audio gain control to the 2nd audio amplifier transistor whose output is clipped by a pair of small-signal diodes and fed to the audio output stage. The output of the final transmitter audio amplifier stage is fed through a 2nd gain control (labeled DEVIATION) to a Varicap modulator. This final gain control, as well as the microphone gain control, can be varied to produce the deviation desired.



Top view of the Regency HR-2 showing the frequency switch, receiver crystal sockets (at left of rear switch deck) and transmit crystal sockets (at left of front deck).

Performance

The unit functioned well from start. Modulation quality and receiver audio were excellent. The controls are functional and easy to operate. When compared to the published specifications the following results were obtained:

	Claimed	*Measured*
RECEIVER SENS. 20DB:	0.35 nom. μv	0.45 μv
SELECTIVITY:	6db±16 kc	exceeded
	50db±32 kc	exceeded
MODULATION ACCEPTANCE:	±15 kc	±22 kc
POWER OUTPUT, TRANSMIT:	10 watts	12 watts
DEVIATION:	Preset ±10 kc	±18 kc
FREQUENCIES:		
TRANSMIT:	146.940 mc	146.9387 mc
RECEIVE:	146.940 mc	146.9415 mc

The receiver sensitivity did not meet the nominal specifications published. However, giving a nominal specification for 20 db of quieting is somewhat unusual. Normal practice is to list a minimum acceptable standard and then try to beat that standard. In the case of both commercial high band and amateur 2 meter f.m. equipment the normal specification for 20 db quieting is 0.5 microvolts. Often the actual sensitivity is about 0.35 microvolts. Thus, the 0.45 microvolts for 20 db quieting is not an indication of a bad receiver. The only indication is the need for a minimum standard rather than a nominal standard. In both cases of frequency measurement the tolerances were within the 0.001% receive and 0.0015% transmit tolerances. Deviation was excessive for areas in which wideband operation is still in use. However, both the deviation and microphone gain controls had to be adjusted to achieve ±5 kc for narrowband work. This required a little juggling of the controls. The result was a good sounding ±5 kc deviation transmitted signal. The physical size of these transmitter audio is such that they require a small screwdriver and a light hand, but they can be adjusted for narrowband.

Construction

The construction of the Regency HR-2 is

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[1] *The Integrated Circuit Data Book,* Motorola Semiconductor Products, Inc., Phoenix, Ariz., 1968, pages 9-67 — 9-70.

excellent. Good quality printed circuit boards with immersion tin plating are used throughout. All solder connections were excellent with no resin residue. The only criticisms which can be justified are, first, the "Mickey-Mouse" mounting of the pilot lamp. This lamp is held in place by a spring clip which makes the ground connection. The center connection (hot side) is soldered to the bulb making easy replacement impossible. The second criticism is the placement of the microphone jack on the left side of the chassis. When the unit is installed in an automobile there is a distinct chance of the protrusion of the microphone plug interferring with the right leg of the driver. This plug, along with the beginning of the coiled cord project over three inches beyond the side of the unit. This, however, can be overcome by replacing the plug with a Switchcraft 230 (or equivalent) "Flat Plug." This type of plug protrudes less than 1/2″ from the side of the unit, and the microphone cord comes out at 90° from the shank of the plug. Thus, the interference with the driver can be avoided.

Conclusion

Basically the Regency HR-2 is a high-quality transceiver for use by the amateur f.m.'er. The power output is sufficient for normal direct contacts as well as those contacts made through repeaters. The six channel capabilities along with the built-in strapping options to allow pairing of various crystals gives the amateur f.m.'er the versatility needed while travelling through areas with repeaters on frequencies other than 146.34/146.94 or 146.34/146.76 mc. The HR-2 was not designed to compete with the high-priced commercial equipment, but in many cases it can do the same job as those units in its power class. The expenditure of $229.00 including crystals for simplex operation on 146.94 mc is well worth considering. The manufacturer is Regency Electronics, Inc., 7900 Pendleton Pike, Indianapolis, Ind. 46226.

—K9STH

CQ Reviews: The Standard SR-C806MA Transceiver

BY GLEN E. ZOOK,* K9STH

ONE of the important contributions to the amateur f.m. market is the SR-C806MA transceiver imported by Standard Communications Corporation, Wilmington, California. This unit is designed for operation in the 2 meter (144-148 mc) amateur band. The transceiver has provisions for up to twelve channel operation with a minimum power output of 10 watts. Accessories include a base station a.c. supply (SR-C12/120-1) and a 25 watt output final amplifier (SR-CL25L). The unit is equipped from the factory for operation on four channel-combinations: 146.94 mc transmit/ 146.94 receive; 146.34 mc transmit/ 146.76 mc receive; 146.20 mc transmit /146.80 mc receive; and 146.34 mc transmit/ 146.94 mc receive. These frequencies cover the most used repeater frequencies as well as the national calling frequency of 146.940 mc. The receiver is a solid-state dual-conversion superheterodyne design. A ceramic filter is incorporated into the low i.f. stages for adjacent channel rejection. The transmitter is also completely solid-state. A low power switch is located on the front to reduce the 10 watt output to 0.8 watts for short range QSO's. Modulation is phase type (as used in most commercial equipment) and frequency stability is 0.001%. The unit is equipped with a sturdy mounting bracket, built-in 2¼ inch speaker, dynamic push-to-talk microphone, and crystals for operation on four channel-combinations. Additional accessories include filters for alternator hash, and a 25 watt power amplifier.

The Standard Communications Corp. model SR-C806MA 2-meter f.m. transceiver.

Technical Details

The SR-C806MA employs completely solid-

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*FM Editor, *CQ*.

state circuitry. Special features include separate metering jacks for both transmitter and receiver sections. These jacks make tune-up and servicing easier and more accurate. A tuning meter is also provided which gives the following information: relative power output; relative signal strength of received signal; and battery (or power supply) voltage. A twelve position channel selector switch is provided. A red panel light indicates transmit and both the channel selector switch and tuning meter are illuminated.

Receiver

The dual conversion receiver employs an 11.7 mc high i.f. and a 455 kc low i.f. The receiver front end consists of two stages of bi-polar transistor amplification. These transistors are protected during transmit by a diode-connected transistor which shorts any residual r.f. to ground. The 1st mixer stage is a low-noise MOSFET to minimize intermodulation and provide low-noise conversion. In this stage the 2 meter signal is heterodyned to 11.7 mc by the injection of a signal 11.7 mc below the desired frequency. This signal is provided by a multiplier-oscillator chain consisting of three transistors. Provision is made to warp or "rubber" the receive crystals on-frequency operation.

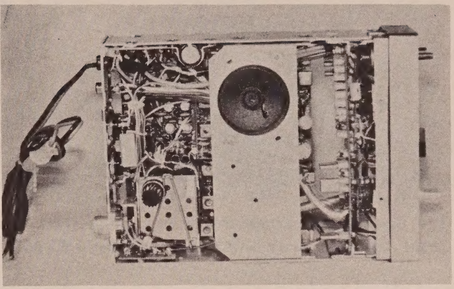
The 11.7 mc i.f. signal is further amplified in a single transistor stage and applied to the 2nd mixer. In the 2nd mixer a 12.155 mc signal is heterodyned producing a 455 kc low i.f. The 455 kc signal passes through a ceramic filter (for adjacent channel rejection) and then through five stages of amplification. This high level signal is then limited and detected. The resulting audio is amplified by two stages of audio, and applied to the 8 ohm speaker via a push-pull output stage.

The squelch circuit is noise activated. The noise is amplified in two stages and then detected to produce the d.c. voltage which controls the squelch switch transistor. This solid-state switch controls a d.c. voltage which cuts off the first audio amplifier stage until a signal overcomes the noise (quiets). At this time the first audio stage turns on and the audio circuits of the transceiver operate.

When a signal is received, the detection of the 455 kc i.f. signal by a diode pair produces an indication of signal strength on the tuning meter. During transmit the r.f. output is rectified by a diode and applied to the meter amplifier to produce a relative output reading.

Transmitter

The transmitter section of the SR-C806MA is crystal controlled by up to twelve switch selectable crystals in the 8 mc range. Frequency multiplication of 18 times is accomplished in two triplers and one doubler stage. Two stages of straight-through amplification are used before the transistor output stage. The output signal is applied through a four section Pi-net to the antenna change-over relay. Nominal output impedance is 50 ohms. If the antenna match is such to produce a high reflected power which may damage the transmitter, a directional coupler senses the mismatch and causes the power to be reduced to prevent damage. This is accomplished by controlling the gain of the pre-driver transistors through a two-stage d.c. amplifier circuit.

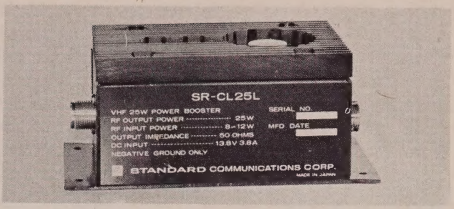


Top view of the SR-C806MA transceiver showing the crystal mounting board on edge behind the front panel.

The audio circuitry of the transmitter section consists of a two transistor amplifier wherein a 6 db/octave pre-emphasis is added. The audio signal then passes through a peak-limiter circuit and a low-pass filter to an integrator circuit. This integrator circuit serves to offset the 6 db/octave pre-emphasis to produce a flat output during normal usage. If the audio input signal is sufficient to produce over-deviation the clipper reduces the negative and positive peaks of the audio signal. The signal is reshaped by the low-pass filter and is flattened by the integrator. The audio signal is then applied to the phase modulator.

Construction

Both the basic transceiver and the 25 watt amplifier (SR-CL25L) are constructed largely of printed circuits. The material used in the construction of these circuits is a phenolic material similar to the XXXP type sometimes used by manufacturers in the United States. This type of board requires extreme caution in repairing. If excessive heat is applied during either soldering or unsoldering operations the plating will often lift from the board material. The boards in the sample transceiver and amplifier showed signs of rework and several questionable solder joints. The boards had not been immersion tinned. The majority of copper plating is protected from oxidation by a lacquer-type coating. The amplifier accessory had several capacitors and chokes supported only by one lead, with the other lead attached to the second lead of another component, also supported by one lead. Also, the amplifier has an adjustment potentiometer sup-



The Standard Communications accessory 25 watt output power amplifier, model SR-CL25L.

ported by leads only and extending beyond the edge of the circuit board.

Two transceivers and two 25 watt amplifiers were examined. One transceiver and one amplifier had minor pieces of hardware missing (mainly screws used to secure the cases). The microphones of both transceivers were missing the retainer ring which mates with a threaded sleeve on the microphone jack. Without this ring it is possible to pull the microphone from the socket during mobile operation.

These quality control problems were discussed with the manufacturer, and numerous improvements in inspection and final assembly have been instituted as described later under "Evaluation."

Performance

The analysis of published performance data versus actual performance achieved is as follows:

Transmitter	Published	Actual
R.F. OUTPUT (at 13.8 v.d.c.)	10 w.	12 w.
FREQUENCY TOLERANCE	.001%	.0008%
DEVIATION	±7 kc (nom.)	±18 kc
Receiver		
SENSITIVITY (20 db quiet)	0.5 μv	0.3 μv
ADJACENT CHANNEL REJECT	60 db	65 db
FREQUENCY TOLERANCE	.001%	.0005%

The deviation of the transmitter was excessive for wideband operation, let alone narrowband. There is an internal deviation adjustment control which can be used to reduce the deviation level. Audio quality was excellent even at the extra wide deviation. The sensitivity and adjacent channel rejection were excellent as were frequency tolerances in both transmitter and receiver sections.

As stated before two transceivers and two amplifiers were examined. The first transceiver had a DOA (dead-on-arrival) transmitter section. The receiver was excellent, however. The second transceiver was used for comparison to published specifications. The first amplifier was coupled to the second transceiver for performance tests. This amplifier had a respectable power output of 21 watts at 12 v.d.c. source voltage. However, when the source voltage was increased to the manufacturer's rating of 13.8 v.d.c. the amplifier immediately failed. The second amplifier was then tried with greater success. At 12 v.d.c. the output was 23 watts. When the source voltage was increased to 13.8 v.d.c. the output increased to 29 watts.

A comparison of the two amplifiers showed that the unit which failed utilized transistors of Japanese manufacture, thus indicating an older model. Because of these failures Standard has now changed to transistors manufactured by TRW in the United States. The second amplifier used these TRW transistors. Also, the workmanship in the second amplifier was vastly superior to that in the first model. The newer model amplifier still uses the XXXP phenolic boards, but soldering techniques seem to be improved.

Evaluation

The Standard SR-C806MA transceiver incorporates features not always found in either commercial f.m. equipment or in equipment designed for amateur f.m. use. These features include twelve channel operation (with various strapping options also possible), complete solid-state design, optional power amplifier, and central metering jacks. The basic performance meets, in most cases, the manufacturer's published specifications. However, the defects in workmanship tend to overshadow the basic merits of the unit. The obvious indication is a need for increased quality control. The Standard Communications Corporation final assembly plant in the United States has recently undergone a personnel change in the final assembly and quality control areas in an attempt to correct these difficulties. The units examined had been produced before the personnel changes. Also, plans are underway to replace the phenolic boards with the newer "Poly-Clad" type of material. This material is not of the quality of a good glass board, but is quitet acceptable in terms of both durability and servicability. When the new type of board material is implemented, many workmanship problems associated with the XXXP material will disappear, thus resulting in a unit whose construction should please even the most discriminating amateur.

One inherent problem which Standard recognizes is the audio quality of the built-in 2¼" speaker. This speaker is too small for good audio reproduction. Thus, an external speaker (SR-C202KH) is available. There is two watts of audio available at a jack on the rear of the transceiver to drive this or similar speaker. A number of other accessories are available to improve or modify the performance of the SR-C806MA:

Basic transceiver	SR-C806MA	$335.00
25 w. power amp.	SR-CL25-3H	159.95
10 w. base station a.c. power supply	SR-C12/120-1AH	49.95
Portable battery supply	SR-CK002H	19.95

[*Continued on page 82*]

The Table-Top Maxi Linear

Compact, up-to-date design of a legal-limit amplifier.

BY JO EMMETT JENNINGS,* W6EI

WITH so many good articles being written describing linear amplifiers, I have been reluctant to write an article that did not include some new or original ideas. Both the linear amplifier and power supply described here incorporate new features which may be of interest to builders either of these units or of other designs.

Amplifier Design

The linear amplifier is a three band design covering the amateur 80, 40 and 20 meter bands. An Eimac 3CX1000A7 external anode grounded grid power tube is used with power capability up to the legal limit. Band selection is by means of a single rotary switch which selects a separate parallel-tuned plate circuit for each band by means of three Jennings d.p. d.t. vacuum relays. The second relay poles select corresponding output link coils. Antenna switching is also handled by a Jennings vacuum relay.

The design of the plate circuit warrants some explanation. Individual toroid coils of special design are employed for compactness and efficiency. The individual toroids were chosen rather than the more currently popular pi-network because of space. Not only is a 2 kw pi-network inductor quite large, but conventional solenoid wound inductors require considerable spacing from shielding enclosures due to the large field developed at high power with a large inductor. This makes compact construction difficult. They are also quite costly.

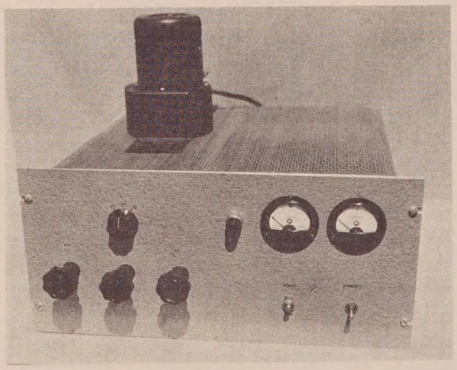
Ferrite cores were not used in the toroids because of instability due to high field intensity, as well as their high cost. Instead, air wound toroids of unusual design are used (see fig. 1). Two identical solenoid windings are made, but wound in opposite directions to permit adjacent ends to be connected together. The two windings are then shaped into the toroid configurations of the dimensions shown in fig. 1.

Since the total plate inductor r.f. current is divided equally between the two halves of each toroid, a smaller diameter conductor may be safely used than is normally the case. In fact, heating of the toroids is less than with most solenoid copper tubing coils. Separate coils for each band were required because of the difficulties associated with shorting out and switching sections of the toroids.

Links to the three toroid coils are of #14 plastic insulated wire wound over the ground ends of each toroid, straddling both halves. Coils are self-supported by their leads.

Plate tuning is handled by three separate Jennings vacuum variables capacitors which are panel mounted and individually adjusted for each band.

Input is broadband, capacitor coupled to the filament of the 3CX1000A7 through a



The Table-Top Maxi Linear is completely self-contained, with power supply, behind an 8¾" high standard rack panel. The obvious exception is the extra exhaust blower mounted above the 3CX1000A7 amplifier tube.

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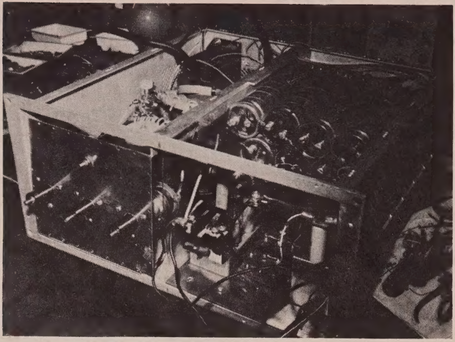
*120 Manfre Rd., Watsonville, Cal. 95076.



Overall view of the Maxi Linear during construction shows the amplifier subpanel with the three vacuum variable capacitor shaft couplings at the lower left. The surplus shielding enclosure used can be duplicated with angle stock and perforated sheet aluminum if the design is to be copied. The entire right-hand portion of the enclosure is occupied by the power supply.

.01 mf capacitor. Filament isolation is provided by a Jennings Industries FC-32 filament choke.

Power Supply

The all solid-state power supply is designed to be fed from a 230-240 volt single-phase a.c. line. Steps have been taken to provide as much protection as possible for the silicon bridge rectifiers, which are susceptable to destruction by transients. The usual rule of thumb has been to use diodes totaling at least four times the transformer PIV in each arm of the bridge.

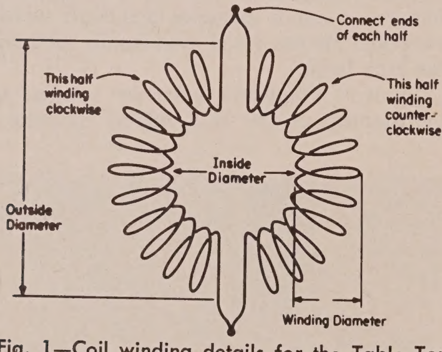

Connect ends of each half
This half winding clockwise
This half winding counter-clockwise
Inside Diameter
Outside Diameter
Winding Diameter

Fig. 1—Coil winding details for the Table Top Maxi Linear.

80 m.—Each half 52t. #14 Formvar wire. Winding dia. 1½". Inside dia. of toroid, 2" outside dia., 5". Link: 17t. #14 plastic insulated wire.

40 m.—Each half 28t. #12 Formbar wire. Winding dia. 1½". Inside dia. of toroid, 1½"; outside dia., 4½". Link: 10t. #14 plastic insulated wire.

20 m.—Each half 20t. #10 Formvar wire. Winding dia. 1½". Inside dia. of toroid, 1⅜"; outside dia., 4⅜". Link: 6t. #14 plastic insulated wire.

The plate transformer is the cause of most of these rectifier failures, since the unloaded transformer has a very high *Q* compared to the low or even unity *Q* of the fully loaded transformer. The diodes are destroyed when the transformer is de-energized. Such problems can be controlled by using a capacitor input filter system of sufficient size, at least 75 mf and up to 150 mmf. Voltage output of such a system is quite high, and in the event that the transformer available to the builder will produce voltages in excess of what may be safely applied to the final amplifier, a choke input filter may be used, although different means of transient suppression must be employed. A suitable alternate system uses a transient suppressor at the transformer primary which clips at approximately 26 volts above the peak voltage of the a.c. line. The moderately priced suppressor measures about the same as a small v.o.m., and is available from Jennings Industries.

With capacitor input, a low impedance transformer can develop inrush currents up to several hundreds amperes. To limit this high energizing current, a resistor is added in series with the transformer primary by a relay, in conjunction with a time delay circuit consisting of a diode, a capacitor, and a series resistor as shown in fig. 3. A one or two second delay in removing the current limiting resistor from the circuit is sufficient to eliminate lights blinking, as well as controlling dangerously high currents through the rectifier bridge.

Although there are many different time delay relays on the new or surplus market, the *R-C* circuit used is satisfactory. The 48 volt d.c. relay happened to be available. A 120 volt relay would also work, as would a lower voltage relay, but the lower voltage relay would exhibit proportionally higher solenoid current, demanding a much higher capacitance to produce the desired time delay. In any case, the series resistance will have to be determined by experiment, since pull-in and drop-out currents vary even among relays of the same type. A rough calculation will give a suitable starting point, but the precise series resistance must be deter-

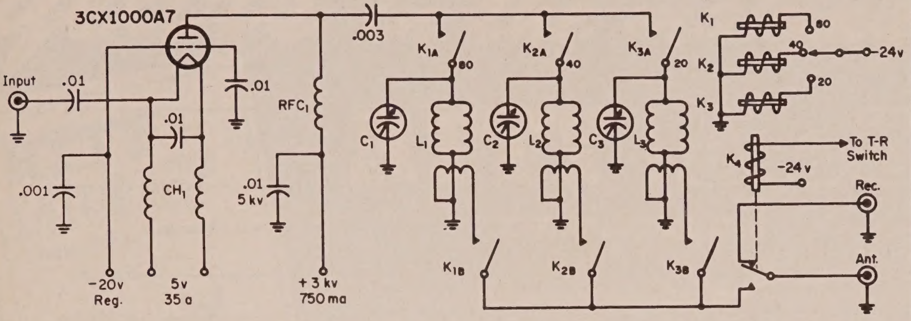


Fig. 2—The Table-Top Maxi Linear for 80, 40 and 20 meters. Inductors are specifically designed toroids. Band changing is by vacuum relays selecting individual tuned circuits.

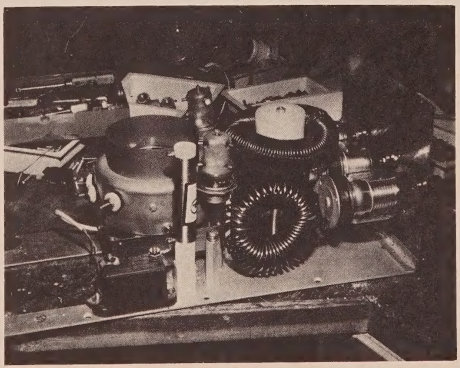
C_1—500 mmf 3.5 kv vacuum variable capacitor. Jennings UCSL 500.
C_2—250 mmf 3.5 kv vacuum variable capacitor. Jennings UCSL 250.
C_3—100 mmf 7.5 kv vacuum bariable capacitor. Jennings GCS 100.
C_4—Three .001 mf 5 kv doorknob capacitors in parallel. Centralab 858.
CH_1—Filament choke. Jennings Industries FC-32.
K_1—K_3—D.p.d.t. vacuum relay, 24 v.d.c. coil. Jennings RB-1.
K_4—S.p.d.t. vacuum relay, 24 v.d.c. coil. Jennings RB-1.
L_1-L_3—See fig. 1 for construction details.
S_1—Single pole three position rotary switch.

mined by means of a rheostat which would be replaced by a proper value fixed resistor if desired.

Construction

The Maxi Linear is constructed entirely behind an 8¾" x 19" rack panel. Without going into precise construction details, the prospective builder can develop a fair idea of its construction from the photographs. The amplifier subassembly is built on a plate of heavy gauge sheet aluminum with a sub-panel of similar stock fastened to the chassis plate with angle aluminum. Over a circular cut-out in the chassis-plate is mounted a "muffin-tin" fan directed to blow air up through the Eimac air-system socket for the 3CX1000A7 which is mounted on the blower. For additional cooling, a squirrel cage blower is mounted on the top shield plate of the final enclosure with its air intake held against a hole in the cover (over the final tube) and its exhaust blowing to the rear. A single blower of large capacity would undoubtedly replace the two smaller units used here, but these were available, and lent themselves to the desired construction.

The three vacuum relays for band-changing are mounted to the final-tube air duct on small brackets, placing them at a convenient distance from the anode connection ring to which three .001 mf doorknob capacitors in parallel have been bolted. With the three vacuum variable capacitors mounted to the sub-panel, there is ample room between them and the amplifier tube to permit installation of the three toroid coils, one at the top and



View of the amplifier sub-chassis shown from the left during construction. Links for output coupling are not yet installed, nor is the third band-switching vacuum relay mounted on the 3CX-1000A7 air-system socket chimney.

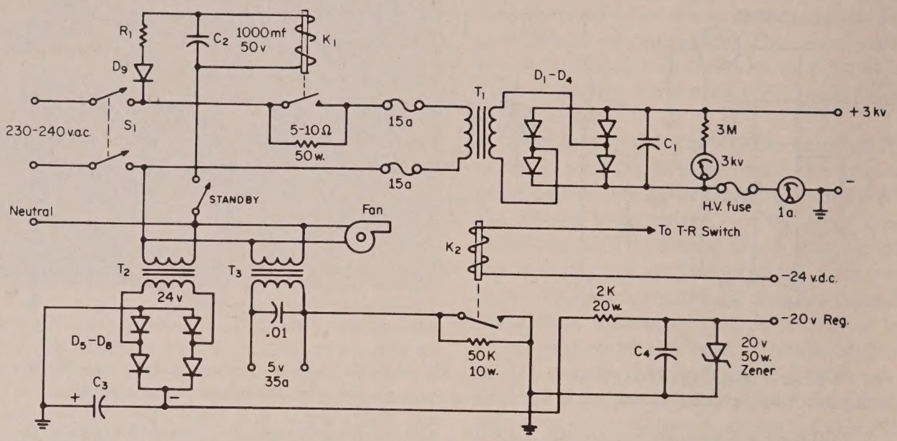
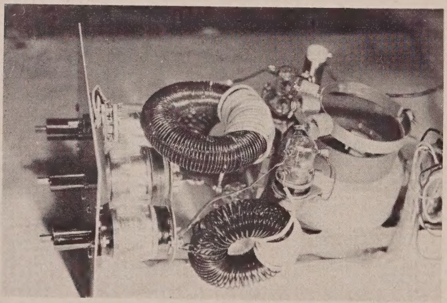


Fig. 3—Power supply for the Table Top Maxi Linear.

C_1—75-150 mf 3 kv. Made up from series and parallel electrolytic capacitors as available. Computer grade types from surplus are suitable.
C_2—1000 mf 50 v. electrolytic.
C_3—100 mf 100 v. electrolytic.
C_4—50 mf 50 v. electrolytic.
D_1-D_4—High voltage bridge rectifier. Jennings Industries JB-8.
D_5-D_8—Low voltage bridge rectifier. Jennings Industries JB-88.
D_9—1 a. 300 v. silicon, diode.
K_1—48 volt d.c. relay, s.p.s.t. contacts, 20 amps.
K_2—24 volt d.c. relay, s.p.s.t. contacts, 20 amps.
R_1—See text. 1 K 50 w.
S_1—D.p.s.t. toggle switch, 20 a. contacts.
T_1—2.2 kv, 750 ma plate transformer.
T_2—24 v. 1 a. transformer.
T_3—5 v. 35 a. filament transformer.

one at each side. The fourth vacuum relay for antenna switching is mounted to the chassis plate between the vacuum variables and the final tube.



As construction proceeds, this view shows output links installed and connected to the band-switching vacuum relays. Coupling from the plate to the tuned circuits is with three .001 mf doorknob capacitors in parallel. The antenna changeover relay is partially hidden between the two toroids.

Power supply construction is necessarily compact, but actual layout must be determined by the available components, *i.e.*, plate transformer, filter capacitors, relays, etc. Regardless of actual configuration, however, extreme attention must be paid to adequate insulation of high voltage lines and components, and to ample ventilation of heat-producing components. The compact nature of the supply calls for more care in component placement and wiring than is the case in a more open design.

Conclusion

Whether duplicated or used simply as idea material. The Table Top Maxi-Linear provides the maximum performance in a minimum-size package, using up-to-date techniques and components. If no other virtues existed for the Maxi, the fact that it could run reliably at the legal limit for days on end would be reason enough to warrant its investigation. ■

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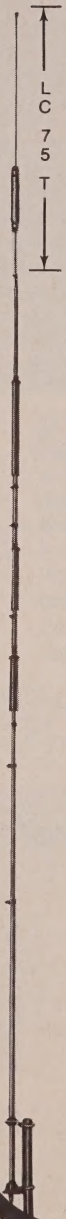

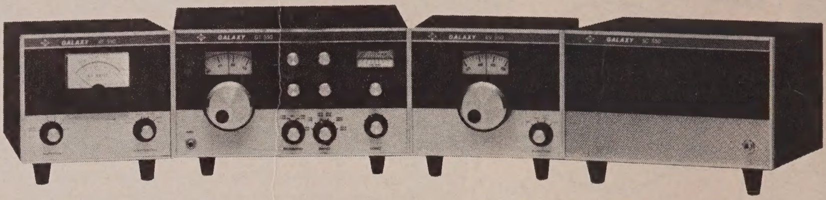

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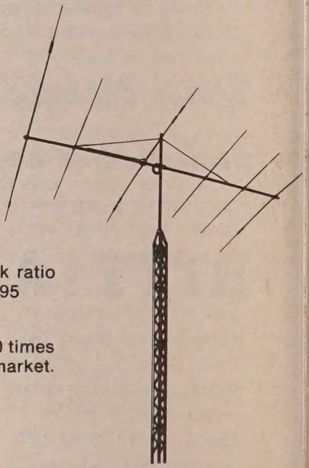

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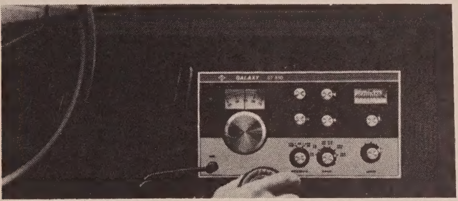

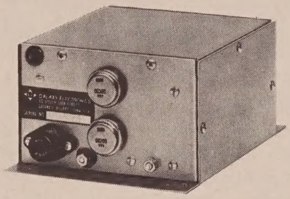

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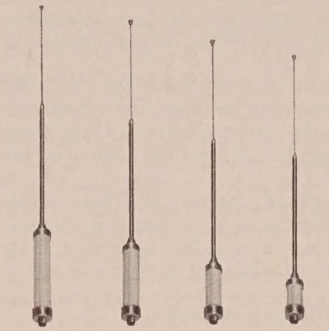

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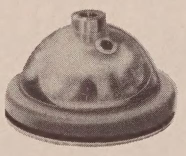

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Results of the 1970 CQ World Wide WPX SSB Contest

BY FRANK ANZALONE,* W1WY

LAST year's WPX SSB Contest (April 1970) will long be remembered as the year of all those crazy prefixes. The PQ–PU series in 1969 at least gave some indication that it was in the PY area, but the Brazilians really came up with a dilly this time. No one really figured that ZV—ZZ were PY's in disguise. Indeed so rare was the regular PY prefix that a would-be comedian wanted to know "what country" that was.

And to add to the confusion we had an XQ from Chile, OG & OI in Finland, HT in Nicaragua and HU from Salvador. Not to mention RA & RJ on 10 and UK for the club stations in the USSR.

The WPX chasers had a field day, but those that were not on for the contest week-end are out of luck. In the case of Brazil and a few others those calls were assigned for the contest period only.

Gen. Kleber Rollin Pinheiro, PY1BOL, director of Telecommunications in Brazil, is responsible for all these exotic calls each year. This plus the work and effort put in by Flavio, PY1CK in printing and distributing log forms, summary sheets and check lists, was in no small way responsible for making this an exciting contest and putting Brazil at the top of all participating countries.

Another highlight of the contest was the increased activity on 40 and 80 due to the new rule giving double QSO points on those bands.

Roger, G3NLY, a confirmed 7 mc DXer approved of the modification and says there was more activity on 40 than in previous years.

However it did present some problems since some of the fellows were not aware of the extra points on 40 and 80. It was necessary to re-score many logs. Bernie, W8IMZ estimated that he must have re-scored at least 50 Europeans. And a few are counting the multiplier from each band. It's just not done that way fellows. A prefix is counted *only once* as a multiplier in this contest.

Some of those scores on the lower frequencies will appear out of line, especially YV1BI on 40 and YV5BTS on 80 but it still takes a lot of 6 pointers to run up that kind of a score. Nice going boys, and congratulations Bill in regaining your crown as the "Champ" on 80.

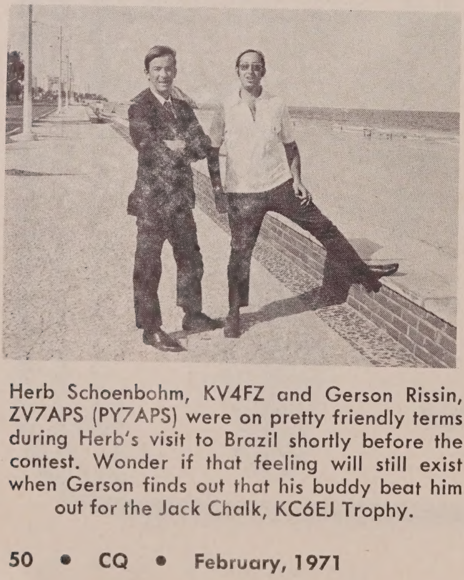
Gene Nurkka, VK9GN was on a state side trip during the '69 contest, but on his return to New Guinea he was determined to avenge his near miss for top honors in the 1968 affair. But once again Gene was denied, this time in the person of Jack Reichert, W3ZKH who went down to Curacao, fired up PJ9JR and made "Top Banana" in the contest. Congratulations fellows, those are mighty fine scores.

Gene is high man for Oceania but is not eligible for the KC6EJ Trophy, having won it in 1968, (three year clause on trophy awards).

Dale Green, VE7SV repeated his high score on 14 mc for Canada, but is also not eligible for the VE6TP Trophy having won it last year.

The Trophies therefore will go to Katashi Nose, KH6IJ and R. T. Kaye, VE7LB respectively, runner-ups in those areas.

And how about that "donnybrook" between KV4FZ and ZV7APS on 14 mc. Evidently Herb and Gerson had planned this one during Herb's trip to Brazil, but I am sure no operating secrets



Herb Schoenbohm, KV4FZ and Gerson Rissin, ZV7APS (PY7APS) were on pretty friendly terms during Herb's visit to Brazil shortly before the contest. Wonder if that feeling will still exist when Gerson finds out that his buddy beat him out for the Jack Chalk, KC6EJ Trophy.

---

*Chairman, Contest Committee.

The boys at GD3TXF, (GD3TXF, F5QQ, GW3-WVG), ran into some pretty foul weather in their expedition to the Isle of Man. Ron, F5QQ seems to be well equipped for the cold weather.

TROPHY WINNERS

WORLD—Single Operator, Single Band. The Jack Chalk, KC6EJ Trophy. Won by: **Herb Schoenbohm, KV4FZ.** (14 mc)

WORLD—Single Operator, All Band. The Don Murray, K4FMA Trophy. Won by: **Jack Reichert, Jr., PJ9JR.** (W3ZKH)

WORLD—Multi-Operator, Single Xmtr. The Don Miller, W9WNV Trophy. In memory of Ted Thorpe, ZL2AWJ. Won by: **Station UK9AAN.** (Oprs: UA9BB, UA9BE, UA0BP, UV9AB, UW9AF, UW9BY)

WORLD—Multi-Operator, Multi Xmtr. The Don Miller, W9WNV Trophy. In memory of Chuck Swain, K7LMU. Won by: **Station 4Z4HF.** (Oprs: K2IXP, 4X4-FV, 4X4GV, 4X4NJ)

CANADA—Single Operator, Single Band. The Gene Krehbiel, VE6TP Trophy. Won by: **R. T. Kaye, VE7LB.** (21 mc)

OCEANIA—Single Operator, All Band. The Jack Chalk, KC6EJ Trophy. Won by: **Katashi Nose, KH6IJ.**

were exchanged. That was a tremendous performance by both fellows.

In both multi categories top honors go to a couple of Asian stations, both taking advantage of all those juicy prefixes and 6 pointers on the lower frequencies, just across the border in Europe.

So both W9WNV Memorial Awards go to Asia this year, the Single Transmitter to UK9-AAN, and the Multi Transmitter to 4Z4HF.

The Chelybinsk Radio Club is developing into quite a competitive group, and UK9AAN under the leadership of Victor, UW9BY and Sam, UA9AN can be expected to be in the Top group in future contests.

Some fellows reported conditions as being good, others didn't think they were so hot. So how do you account for all those over a million point scores, especially on 10 meters. Somebody must be doing something right.

We wonder if 160 should be included in this contest. GM3YCB was the only one to submit a log on that band, says he found very little interest on the band by other stations.

For that matter there are many uninterested operators on other bands too, but most any one will give you a contact for contest credit. You do not necessarily have to be a participant in order that your contacts be credited to a contestant. DJ8FRA was a bit unhappy with the XE boys who refused to make any European QSOs, saying they were not in the contest.

G3NMH does not approve of stations going off to special call areas and taking advantage of operating from a rare prefix. Maybe he had GC3UML in mind. Laurie Margolis usually goes over to Guernsey and activates that comparitively rare island during a contest. It earned him the top European score in this one. And after all isn't that the name of the game?

If it were not for Contest Expeditions, many areas with little or no ham activity would soon become comparitively rare. Fellows that go to the trouble and expense to put these spots on the air during a contest not only have our

[*Continued on page 51. Scores overleaf*]

ZV2DFR, Top South American on 28 mc. Tom is well equipped for all band operation but concentrated on 10 this year.

TOP SCORES

SINGLE OPERATOR ALL BAND

PJ9JR 2,972,826
VK9GN 2,057,160
GC3UML ..1,628,556
W5RER 1,472,790
VU2DK 1,373,606
CR6GA 1,357,056
UA1DZ 1,305,678
OG1YR 1,143,376
KH6IJ 1,117,831
DU1FH 1,065,565

SINGLE OPERATOR SINGLE BAND

28 mc

KG6AQY ..1,096,275
5Z4LS 1,059,723
ZV2DFR 1,010,814
K5MDX 493,929
IR0ZV 338,829
LZ1XA 322,952

21 mc

YV1SA 1,020,352
EL2BZ 893,661
W3AZD 869,226
VE7LB 657,324
K2DJD 572,112
ZX2DVH 550,564

14 mc

KV4FZ 2,031,246
ZV7APS 1,756,265
XQ3ZN 983,625
VE7SV 952,884
OH2BH 844,393
TJ1AW 793,440

7 mc

YV1BI 237,060
DJ6QT 207,552
G3NLY 156,212
IR0AMU 118,442
DL8PC 116,750
DL6WE 104,860

3.8 mc

YV5BTS 402,930
DL3XO 132,720
DJ2YA 122,924
K2RSR/VP9 ..88,888
OI3QA 76,446
DK2UO 73,440

MULTI-OPERATOR SINGLE TRANSMITTER

UK9AAN ..3,957,212
KP4ES 2,401,560
CR4BC 2,100,526
KH6SP 1,980,342
GD3TXF 1,974,732
G3WYX 1,768,732

MULTI TRANSMITTER

4Z4HF 4,913,064
DL0WW 2,225,951
UK6LAZ 1,983,934
JA3XPO 984,900
W3SS 479,050
SM5BPJ 417,435

Number groups after call letter denote: Band, Score, QSO's and Prefixes. Bold listings are certificate winners.

SINGLE OPERATOR
North America
United States

W1PCD	**A**	**62,436**	**169**	**129**
W1FLN	"	15,912	88	68
W1UOP	**28**	**40,180**	**145**	**98**
WA1FBX	"	22,440	109	85
K1DII	"	11,110	79	55
K1HVV	**21**	**375,199**	**568**	**253**
K1INO	"	98,430	193	141
WA1JKZ	"	7,693	61	49
W1PLJ	"	6,837	55	43
W1UYU	**14**	**41,552**	**117**	**106**
W1EBC	**3.8**	**8,084**	**61**	**47**
WA3BZA/2	**A**	**250,920**	**474**	**205**
W2LEJ	"	200,896	320	172
WB2VQG	"	33,696	159	108
W2MB	"	11,664	58	54
WA2HVH	"	11,604	78	55
WA2CSP	"	7,774	60	46
W2CVW	"	5,460	50	42
F3VN/W2	"	2,392	32	26
W2KXD	"	1,044	20	18
K2BQO	**28**	**143,803**	**311**	**187**
W2DKM	"	115,388	261	182
WA2LLK	"	96,311	262	163
W2QKJ	"	27,666	120	87
K2DJD	**21**	**572,112**	**744**	**274**
W2GZZ	"	231,868	432	196
WB8EQU/2	"	23,895	123	81
W2CKR	"	17,500	88	70
W2KZN	"	2,175	32	29
WA2FGF	"	1,863	28	23
WB2SQN	**14**	**515,844**	**647**	**267**
WA2AYP	"	89,517	253	159
K2RYI	"	26,325	104	81
W2IVP	**3.8**	**12,792**	**101**	**52**
W3KV	**A**	**71,676**	**202**	**132**
K3TVE	"	36,576	143	96
WA3IXF	"	35,776	155	104
W3AXW	"	28,925	115	89
W3VK	"	7,452	54	46
K6JVE/3	"	1,159	22	19
WA3LNM	**28**	**36,487**	**167**	**107**
W3AZD	**21**	**869,226**	**1150**	**277**
K3TGM	"	348,445	560	227
WA3LRO	"	179,292	334	201
WA3LBU	"	38,961	141	111
WA3CGE	**14**	**417,008**	**574**	**268**
WA3EPC	"	40,326	137	141
WA3KEG	**3.8**	**15,128**	**110**	**62**
W3TV	"	180	6	6
WA4PXW	**A**	**458,864**	**726**	**272**
K4BBF	"	220,382	376	202
K4II	"	198,067	371	191
K4DSN	"	173,880	312	230
K4OD	"	114,042	259	166
K4MG	"	113,560	284	167
WB4INE	"	83,083	249	149
K4BAI	"	81,141	240	129
WB4JXN	"	28,797	118	87
W4KMS	"	27,146	98	98
WB6LNS/4	"	22,616	111	88
W4WRY	"	16,543	95	71
WB4GGA	"	14,573	106	79
W4WJJ	"	3,224	59	44
WB4KWT	"	1,925	31	25
WB4KVN	**28**	**212,175**	**415**	**205**
W4DQD	"	191,600	378	200
WB4KZG	"	174,306	322	209
W4WWD	"	119,190	269	174
W4CRW	"	118,505	269	173
K4IUV	"	90,610	334	170
F5HN/W4	"	77,953	223	137
W4DFK	"	68,474	219	146
K4CFB	**21**	**454,220**	**640**	**260**
W4UPJ	"	227,183	393	209
W4TXE	"	213,620	383	220
WA4CCW	"	48,433	167	119
W4HOS	"	29,256	134	106
W4TWJ	"	18,130	87	74
W4WJJ	"	15,808	87	76
W4EEO	"	936	18	18
K1BFX/4	**14**	**158,110**	**311**	**194**
W4BYB	**7**	**38,880**	**126**	**90**
W4WSF	"	1,740	62	45
W5RER	**A**	**1,472,790**	**1444**	**330**
W5QBM	"	267,520	475	209
W5LPO	"	100,532	213	164
WA5YAS	"	99,056	251	151
W5QNY	"	6,084	57	39
W5KC	"	5,822	51	41
WA5SMJ	"	476	19	17
K5MDX	**28**	**493,920**	**630**	**280**
W5CCP	"	112,048	297	149
K1DWQ/5	"	94,085	256	155
WA5WEU	"	19,920	105	80
W5OJZ	"	1,518	24	26
W5MSG	"	184	8	8
K6UYC	**A**	**997,696**	**1278**	**262**
K6SXA	"	266,800	481	184
WA6GLD	"	201,586	382	187
WA6OAL	"	171,120	350	184
WA6HRS	"	152,295	312	195
K6PIH	"	92,684	339	94
W6JPH	"	29,754	203	58
VE7BNE/W6	"	12,045	95	55
WB6IXC	"	3,636	39	36
W6ED	**28**	**122,782**	**389**	**138**
WB6FRC	"	102,992	304	142
K6TYL	"	42,210	160	105
WB6OQZ	"	1,380	28	23
K6SVL	**21**	**401,520**	**701**	**210**
K6JYO	"	253,648	507	191
WB6UDC	"	97,865	680	115
WA6PNN	"	73,870	229	105
WB6AUA/6	"	13,359	100	61
K6YRA	**14**	**98,784**	**246**	**168**
W6MAR	"	5,504	50	43
WA6NIR	"	112	8	8
K6AHV	**7**	**66,092**	**233**	**82**
WB6UMX	"	48,008	180	68
K6YNB	**3.8**	**8,670**	**74**	**51**
W7AYY	**A**	**199,108**	**410**	**182**
W7BJ	"	138,910	345	145
W7QN	"	32,545	132	115
W5QQQ/7	**21**	**451,468**	**737**	**236**
W7YQG	"	123,521	348	149
WA9WIF/7	"	3,738	53	42
W8HXZ	**28**	**23,004**	**109**	**81**
WA8ASV	**21**	**216,106**	**371**	**209**
W6IIM/8	"	53,200	169	112
WA8TDY	"	22,488	107	82
WA8MCR	**14**	**41,382**	**146**	**99**
K8QYG	"	688	20	16
W8IHD	**7**	**13,800**	**129**	**60**
W8BDO	**3.8**	**9,690**	**104**	**51**
WA8VMQ	"	1,728	26	24
W9EWC	**A**	**263,562**	**439**	**218**
W9JJV	"	135,275	323	175
WA9UGI	"	12,438	73	62
WA9WVJ	"	528	15	12
K9QFZ	**28**	**82,695**	**247**	**149**
OH1XO/W9	**"**	**5,328**	**77**	**48**
WB9BWU	**14**	**363,203**	**574**	**263**
W9BG	"	78,200	196	169
K9BGL	**7**	**12,400**	**83**	**62**
WA9WLF	"	2,080	61	40
W0ACT	**A**	**149,919**	**309**	**177**
W4UDS/0	"	37,024	145	104
WA0OML	"	26,477	123	83
WA0YCN	"	6,625	75	53
WA0EMS	**28**	**80,795**	**230**	**143**
W5LLB/0	"	31,188	141	92
WA0MOJ	"	13,293	92	63
K0WWX	**14**	**76,076**	**214**	**143**
WA0EPG	"	50,500	169	125

Jack Reichert, W3ZKH operating PJ9JR from the Coral Cliff Hotel in Curacao. Jack not only had a fine vacation but also brought home the bacon, the Don Murray, K4FMA Trophy, for being the world's Top all bander.

WA0ETC	7	14,742	117	63
K0MLH	‘‘	2,304	49	32

Bermuda

VP9GE	A	522,828	888	206
K2RSR/VP9	3.8	88,888	241	82

Canada

VO1AW	A	192,654	324	198
VE1AI	A	188,734	389	182
VE1AJJ	14	20,596	114	76
VE1AIH	3.8	31,284	110	66
VE2UN	A	936,730	1232	283
VE2AQS	21	56,376	193	116
VE2DKP/2	14	6,580	60	47
VE3GCO	A	367,185	498	269
VE3BS	‘‘	15,730	75	65
VE3CEZ	‘‘	14,916	84	66
VE3DNR	‘‘	5,590	45	43
VE3BMV	14	250,182	418	226
VE4RP	A	144,768	294	174
VE4SD	14	30,900	124	100
VE5US	A	820,440	1210	265
W8ILH/VE6	A	164,059	415	161
VE6AGV	‘‘	136,350	327	150
VE6GN	14	161,852	383	172
VE7RN	A	35,026	195	83
VE7IQ	‘‘	27,020	130	70
VE7LB	21	657,324	1160	228
VE7SV	14	952,884	1142	324
VE7IG	3.8	34,400	167	60
VE8NWT	A	181,104	471	154

Canal Zone

KZ5NW	A	11,988	83	54

Greenland

OX5AP	A	158,483	346	167
OX5BL	14	284,902	810	167

Guatemala

TG9GF	7	76,264	175	96

Mexico

XE1LLS	7	35,280	143	63

Nicaragua

HT1MG	A	308,140	699	217

Panama

HP1JC	A	281,840	423	212
HP1AC	21	30,968	164	79

Puerto Rico

KP4CL	A	93,726	327	123
KP4RK	28	9,898	94	49

St. Pierre & Miquelon Is.

FP8AP	A	43,680	266	70

Salvador

HU2CEN	14	607,250	1024	250

Virgin Islands

KV4AM	21	35,020	168	85
KV4FZ	14	2,031,246	2380	343

AFRICA

Angola

CR6GA	A	1,357,056	1606	288

Ascension

ZD8AB	A	57,330	211	98

Cameroun

TJ1AW	14	793,440	1124	240

Canary Islands

EA8GR	A	45,900	144	90

Kenya

5Z4LS	28	1,059,723	1328	267

Liberia

EL2BZ	21	893,661	1216	249

Mozambique

CR7IK	28	265,854	511	177
CR7JP	‘‘	6,079	53	41
CR7IZ	21	26,442	120	78

Rep. of Congo

9Q5GJ	A	23,501	117	71

South Africa

ZS6BLK	28	281,050	545	175

ASIA

Hong Kong

VS6AI	A	11,571	113	57

India

VU2DK	A	1,373,606	1611	299

Iran

EP2DX	A	951,640	1103	296

Israel

4Z4AI	A	767,335	1137	256

Japan

JA3ERG	A	370,557	629	209
JA1WPX	A	136,170	316	153
JA1AAT	‘‘	37,352	150	92
JA6PY	‘‘	20,960	103	80
JA1ANG	‘‘	11,773	84	61
JA1IZZ	‘‘	11,368	70	58
JA8FBM	‘‘	11,368	79	58
JA8AIP	‘‘	8,250	56	50
JA6FPX	‘‘	7,938	66	49
JA7AQZ	‘‘	3,330	37	30
JA4IFM	‘‘	1,998	28	27
JA6BIF	‘‘	1,975	31	25
JA2HCB	‘‘	1,650	39	22
JH1ECG	28	276,134	492	202
JA9AG	28	146,718	330	171
JA1KTM	‘‘	113,373	275	153
JA3IAE	‘‘	83,040	247	120
JH1EHP	‘‘	75,978	226	126
JA1NDO	‘‘	62,475	189	119
JA7BSK	‘‘	49,608	170	106
JH1EVE	‘‘	22,440	106	85
JA1GDN	‘‘	14,553	83	63
JA3UEG	‘‘	4,290	47	39
JA6IYF	‘‘	3,400	51	34
JA2AXB	‘‘	2,184	34	24
JA1AS	‘‘	1,242	27	18
JA2ASP	‘‘	75	5	5
JA1WTI	21	517,358	756	254
JA3LVA	21	431,184	793	208
JA3LDH	‘‘	92,736	232	144
JA9CKD	‘‘	74,276	227	124
JA6BSM	‘‘	63,630	219	126
JA7AQR	‘‘	37,725	158	89
JA9CUE	‘‘	13,603	86	61
JA2EGW	‘‘	4,914	48	39
JA8GHT	‘‘	4,061	54	31
JA0SC	‘‘	2,160	40	20
JA7KBR	‘‘	1,020	26	20
JA2HBF	‘‘	700	19	14
JA2ONH	‘‘	480	21	16
JA2UHR	‘‘	52	5	4
JA4GXS	‘‘	52	5	4
JA0HFE	‘‘	4	3	2
JA5DDF	14	34,080	135	96
JA7HYS	‘‘	22,767	113	77
JA1DJE	‘‘	13,845	80	65
JA5IU	‘‘	10,904	74	58
JA1ALX	‘‘	7,392	56	48
JA3JM	‘‘	6,240	55	48
JA4AQR/5	‘‘	3,069	40	31
JA1BNW	‘‘	2,360	42	20
JA1ZSX	‘‘	176	8	8
JA3SW	‘‘	8	2	2
JA2EKX	7	7,740	45	35
JA2FUP	‘‘	2,376	31	18
JA7DXX	3.8	150	6	5

Laos

WX8DX	A	112,625	366	125

Lebanon

OD5BA	A	344,619	622	177

Ryukyu Is.

KR6JX	28	118,902	343	133
KR6RL	14	315,000	890	150

Saudi Arabia

7Z3AB	A	192,536	400	164

Singapore

9V1PM	14	31,185	188	77

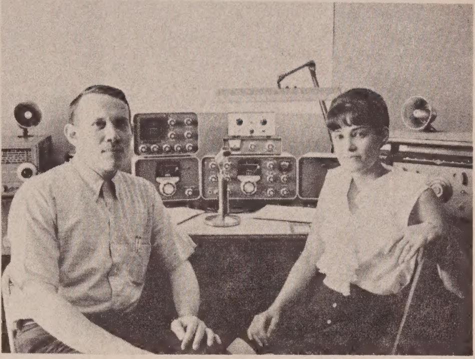
Thailand

HS4ABS	A	300,940	736	205
HS1ABO	21	35,700	206	85

U.S.S.R.

Asiatic

UV9OP	A	460,290	848	229
UA9EU	‘‘	420,240	818	224
UA9OO	‘‘	89,602	258	142
UA9QAA	28	73,080	270	120
RA9CBK	‘‘	65,104	260	104
UW9CR	21	79,756	220	127
UA9MR	14	97,717	270	139
UA9MT	‘‘	14,076	84	68
UA0NL	A	51,397	269	103
UA0TO	28	48,730	211	110
RA0ABV	‘‘	16,280	100	74



The EP2FB multi-op entry from Iran was a family affair, Bill and Rosie Frisbie. (W3EMH & K3ZZS state-side) Not shown in the photo are 4 Jr. Frisbie's, which should keep Rosie pretty busy.

RA0AAE	‘‘	14,880	90	62
UA0SU	21	179,025	564	165
UA0SH	‘‘	95,565	515	115
UW0IQ	‘‘	62,020	768	70
UW0IE	14	290,260	751	154
UV0EX	‘‘	2,210	54	26

Armenia

UG6JJ	14	14,175	88	63

Georgia

UF6CR	A	65,892	290	114

Tadjik

RJ8JAC	28	129,320	401	122
RJ8JBR	28	126,270	413	122
RJ8JAT	‘‘	3,663	50	37

Turkoman

UH8BO	21	39,897	161	99

Uzbek

UI8CD	A	103,740	321	130

EUROPE

Aland Island

OH0NJ	A	40,592	171	118

Azores

CT2AT	3.8	124,762	354	107

Balearic Island

EA6BN	A	46,689	331	79
EA6BJ	‘‘	40,716	193	78

Belgium

ON4XXG	A	128,690	316	170

Bulgaria

LZ1XA	28	322,952	801	158
LZ2EE	14	725	29	25

Czechoslovakia

OK1AGQ	A	247,972	535	188
OK1GO	‘‘	143,441	380	191
OK1WC	‘‘	120,640	437	116
OK1AHZ	‘‘	113,925	321	175
OK2KR	‘‘	61,476	297	141
OK3EA	‘‘	50,292	220	127
OK1ADM	‘‘	36,873	123	107
OK2QR	‘‘	36,062	215	82
OK2DB	‘‘	16,590	102	70
OK2KE	‘‘	1,566	44	29
OK2BEN	28	46,766	239	67
OK2ABU	21	289,822	700	157
OK1AGI	‘‘	44,180	182	94
OK1FV	14	446,571	719	261
OK1BY	‘‘	267,406	506	227
OK1NH	‘‘	17,424	130	88
OK2BFP	‘‘	7,875	127	63
OK1MP	7	69,300	252	126
OK7PSS	3.8	8,360	81	55
OK2BPC	‘‘	800	25	20

Denmark

OZ3SK	A	772,641	991	293
OZ6RT	‘‘	192,465	510	195
OZ5GF	‘‘	77,090	228	130
OZ3KE	‘‘	32,400	146	100
OZ4IA	‘‘	21,888	102	96
OZ7DX	‘‘	11,160	73	60
OZ2LW	‘‘	9,348	100	57
OZ3PO	‘‘	8,835	60	57
OZ1LO	‘‘	7,038	62	51
OZ1CZ	‘‘	1,173	25	23
OZ5KD	‘‘	615	18	15
OZ4H	14	1,882	39	33
OZ9DA	3.8	33,652	167	94
OZ1WX	‘‘	4,160	52	40

England

G3NMH	A	793,197	1101	279
G3XBY	‘‘	147,056	444	202
G3YBH	‘‘	92,036	279	173
G2AJB	‘‘	61,650	232	137
G4JZ	14	130,025	387	175
G3NLY	7	156,212	334	164

U.S.A. TOP SCORES

Single Operator

All Band	W5RER	1,472,790
28 mc	K5MDX	493,929
21 mc	W3AZD	869,226
14 mc	WB2SQN	515,844
7 mc	K6AHV	66,092
3.8 mc	WA3KEG	15,128

Multi-Operator

Single Xmtr	W6HX	1,115,115
Multi Xmtr	W3SS	479,050

Finland

OG1VR	**A**	**1,143,376**	**1563**	**299**
OH5SE	"	812,343	1059	303
OH1VA	"	148,992	407	194
OH6RH	"	18,656	109	88
OH2FB	"	14,600	126	73
OH6XY	"	8,448	66	48
OH2VZ	"	7,128	63	54
OH8OW	"	1,550	26	25
OH2BCV	**28**	**82,128**	**265**	**116**
OH2RI	"	67,405	277	85
OH2BHU	"	7,761	70	39
OH5SM	"	3,379	39	31
OI3NY	**21**	**129,672**	**366**	**151**
OH5TQ	"	9,750	105	50
OH6YP	"	7,182	76	57
OH2BH	**14**	**844,393**	**1117**	**319**
OH2CP	"	207,537	579	209
OH7RM	"	167,808	467	192
OH9QR	"	14,514	152	82
OH6AA	"	6,786	105	58
OI3TY	"	3,655	43	36
OH2BHZ	"	3,108	46	42
OH2BI	"	1,430	27	26
OH5OZ	"	112	8	8
OI3QA	**3.8**	**76,446**	**260**	**137**
OH3XZ	"	4,840	57	44

France

F2YS	**A**	**163,916**	**440**	**172**
F9RM	"	141,702	272	209
F9MS	"	118,294	270	209
F9DW	"	9,633	68	57
F9MD	**14**	**18,673**	**93**	**71**

Germany

DL7LV	**A**	**621,333**	**940**	**279**
DL1MD	"	294,984	510	241
DJ3HT	"	240,672	535	184
DJ3EJ	"	124,344	319	198
DL9HC	"	72,790	223	138
DJ6GF	"	44,392	177	124
DL7FP	"	26,700	161	100
DL1NX	"	19,170	104	90
DL3RA	"	18,432	110	72
DJ3JB	**21**	**530,452**	**977**	**202**
DL2JO	"	200,744	416	184
DL0SA	**14**	**397,620**	**770**	**235**
DL2RR	"	71,100	324	150
DK1QA	"	60,060	290	140
DJ6AU	"	24,072	161	102
DK3BU	"	4,526	78	62
DJ6QT	**7**	**207,552**	**424**	**188**
DL8PC	"	116,750	311	157
DL6WE	"	104,860	302	140
DL3XO	**3.8**	**132,720**	**367**	**168**
DJ2YA	"	122,924	367	158
DK2UO	"	73,550	261	136
DJ8FRA	"	b3,392	235	113
DJ0TA	"	4,950	61	45
DL5DM	**A**	**202,843**	**473**	**193**
DL4JW	"	37,996	146	118
DL4QM	**28**	**56,551**	**210**	**97**
DL5QB	**21**	**54,201**	**234**	**87**
DL4WL	**14**	**10,295**	**79**	**71**
DM2BUL	**A**	**351,090**	**661**	**249**
DM2BTO	"	135,036	345	186
DM2CEK	"	36,421	241	121
DM9ABA	"	27,642	163	102
DM2CDL	**14**	**60,391**	**268**	**131**
DM2AJH	**3.8**	**27,200**	**189**	**100**
DM2EBH	"	2,986	50	39
DM3MI	"	50	5	5

Guernsey (Channel Is.)

GC3UML	**A**	**1,628,556**	**1852**	**339**

Hungary

HA5CQ	**A**	**347,424**	**726**	**231**
HA5DG	"	12,480	85	80
HA5BY	**14**	**29,280**	**187**	**96**
HA5DU	"	15,708	126	84
HA5FQ	"	171	9	9

Italy

I1MOL	**A**	**620,370**	**1016**	**226**
IR0ZV	**28**	**338,829**	**770**	**159**
I1AT	**14**	**138,380**	**385**	**187**
I1SGZ	"	22,875	131	125
IR0AMU	**7**	**118,442**	**329**	**153**
I1ZSQ	"	85,400	261	140

Luxembourg

LX2CQ	**A**	**351,186**	**745**	**187**

Netherlands

PA0DEC	**A**	**77,700**	**229**	**140**
PA0UC	"	32,120	141	110
PA0JPC	"	3,528	54	42
PA0STM	"	1,971	42	27
PA9TK	**21**	**53,268**	**200**	**92**
PA0MIR	**7**	**52,576**	**224**	**106**
PA0HHV	**3.8**	**360**	**15**	**12**

Norway

LA5QK	**A**	**87,764**	**289**	**148**
LA2DL	"	80,266	261	134
LA7JH	"	64,498	230	119
YO2AFB	**21**	**129,558**	**406**	**143**
YO2QM	**14**	**10,902**	**118**	**69**
YO3RF	"	3,404	64	46
YO3JU	"	2,584	51	38
YO2BL	"	1,716	33	52

Scotland

GM3RFR	**A**	**120,400**	**345**	**170**
GM3SDZ	**14**	**128,422**	**433**	**178**
GM3VTB	**3.8**	**34,960**	**177**	**95**
GM3WXR	"	15,004	101	62
GM3YCB	**1.8**	**840**	**64**	**7**

Sicily Is.

IT1JT	**14**	**718,470**	**1160**	**270**

Spain

EA1HS	**14**	**1,628**	**29**	**24**

Sweden

SM5AD	**A**	**691,953**	**1024**	**263**
SM5BHW	**A**	**299,628**	**420**	**287**
SM5DJZ	"	221,214	613	229
SM7TV	"	102,544	357	136
SM3CXS	"	94,895	368	91
SM3AF	"	83,205	266	129
SM5CAK	"	62,625	234	125
SM6BZV	"	55,131	211	141
SM7DER	"	44,625	200	125
SM7AIL	"	30,300	157	100
SM0BDS	"	26,300	157	100
SM7ABL	"	24,378	107	102
SM5BMB	"	23,324	127	98
SM0CWC/0	"	22,338	173	102
LA8RL	"	61,965	185	135
LA8OM	"	41,650	179	98
LA6UL	"	38,001	223	123
LA6XI	"	14,000	101	70
LA3HM	"	9,782	80	73
LA6U	"	5,508	61	51
LA2GN	"	3,230	50	38
LA8SJ	"	784	18	16
LA1YM	**21**	**180**	**10**	**9**
LJ3K	**14**	**108**	**12**	**9**

Poland

3Z8AJK	**A**	**233,825**	**610**	**235**
3Z9BZM	"	46,332	266	117
3Z7AWA	"	29,328	200	104
SP9DUW	"	15,087	241	107
3Z9FR	**14**	**122,271**	**370**	**159**
3Z5BAK	"	36,156	167	92
3Z9BLF	"	29,464	181	116
3Z5CKM	"	18,750	94	75
3Z8AWP	"	3,588	49	39
3Z5BB	"	2,665	56	41
SP9ZW	**7**	**480**	**17**	**15**
SP2BSX	**3.8**	**19,200**	**127**	**75**
3Z5KGT	"	720	20	18

Portugal

CT1BH	**A**	**697,580**	**1040**	**260**
CT1BT	"	609,536	983	256
CT1MC	"	578,376	954	277
CT1QN	"	241,528	590	227

Romania

YO2BB	**A**	**291,842**	**510**	**297**
YO2IS	"	14,101	87	59
SM6CVE	"	9,240	88	60
SM6CKU	"	7,049	53	53
SM5CSS	"	5,618	68	53
SM6BSM	"	3,404	50	37
SM7BUR	"	2,937	38	33
SM3BNA	"	1,624	33	28
SM0KV	"	1,488	24	24
SM5UH	"	736	23	23
SM5BUT	**28**	**215,655**	**473**	**165**
SM0ATN	"	1,750	25	25
SM6CKV	**21**	**405,400**	**735**	**200**
SM5CDY	"	302,680	644	184
SM7CSN	"	235,690	476	185
SM7EVM	"	2,511	34	31
SM2CSA	"	864	23	18
SM7CRW	**14**	**544,236**	**941**	**266**
SM5CMP	"	79,696	303	168
SM5GA	"	40,713	197	123
SM2CAA	"	21,414	128	86
SM2CTY	"	9,272	88	76
SM5DDK	**7**	**66,048**	**236**	**128**
SM6DHU	"	66,860	171	97
SM0AJU	"	35,800	167	100
SM0OY	"	2,944	64	46

Switzerland

HB9AMV	**A**	**124,066**	**444**	**178**
HB9IX	"	13,376	91	64
HB9UD	**14**	**280**	**10**	**10**

Wales

GW3POD	**A**	**449,982**	**774**	**234**
GW3VBX	"	55,998	304	122

Yugoslavia

YU3TXT	**A**	**16,800**	**113**	**75**
YU3APR	**3.8**	**69,160**	**260**	**133**

U.S.S.R.

European

UA1DZ	**A**	**1,305,678**	**1826**	**271**
UA4SH	"	182,300	599	195
UV3GW	"	161,856	505	193
UK3VAJ	"	40,131	195	117
UV3NB	"	32,944	181	71
UA4ZA	"	27,846	179	102
UA3OG	**28**	**199,784**	**605**	**136**
UA4QX	"	35,904	237	102
RA1AKZ	"	11,376	95	48
RC2WAQ	"	10,710	89	45
RA4CAH	"	8,120	88	58
UA4CO	"	5,772	65	52
RP2PBF	"	481	15	13
RA1AET	"	312	14	13
UR3EH	**21**	**291,824**	**624**	**208**
UW1BM	"	241,164	688	198
UA3XM	"	32,528	194	107
UV3NN	"	15,604	121	83
UW4PA	"	15,334	143	82
UW3AO	**14**	**435,240**	**789**	**279**
UA1CS	"	355,302	718	226
UA4CZ	"	132,225	402	215
UA3OL	"	82,810	301	169
UK6AAB	"	35,239	214	131
UA1DA	"	15,576	140	88
UA1OE	"	12,928	114	64
UA3SU	"	9,447	81	67
UA1MU	"	5,590	99	65
UA4RO	"	4,488	48	44
UA3WN	**3.8**	**5,896**	**61**	**44**

Estonia

UR2ED	**A**	**17,085**	**121**	**51**
UR2OV	**28**	**53,379**	**238**	**81**
UR2LH	**14**	**180,774**	**525**	**198**
UR2EK	**3.8**	**19,000**	**123**	**76**
UR2RX	"	6,674	70	47

Latvia

UQ2DV	**A**	**60,480**	**308**	**135**
UQ2IL	"	55,461	281	139
UQ2HM	**28**	**30,000**	**220**	**48**
UQ2NW	**14**	**304,807**	**762**	**227**
UQ2PO	**3.8**	**24,016**	**148**	**227**
UQ2NP	"	14,606	109	67

Lithuania

UP2CV	**A**	**95,904**	**415**	**162**
UP2CL	"	73,032	350	136
UP2PAD	**28**	**50,150**	**211**	**85**
UP2AY	**21**	**19,266**	**109**	**78**

Moldavia

UO5BS	**3.8**	**8,500**	**85**	**50**

Ukraine

UB5DW	**A**	**90,255**	**271**	**165**
UB5QG	"	1,094	33	26
UY5HI	**28**	**111,982**	**369**	**118**
UT5OV	"	37,590	187	70
UB5EM	"	32,116	182	74
UK5GAA	**14**	**195,624**	**506**	**198**
UB5JK	"	80,652	408	156
UT5LY	"	39,603	233	129

White Russia

UC2BF	**A**	**60,760**	**225**	**140**
UC2WE	**14**	**116,365**	**397**	**185**
UC2DR	"	4,500	76	50

OCEANIA

Australia

AX1AOP	**14**	**6,405**	**66**	**35**
AX2OO	**A**	**156,096**	**380**	**144**
AX2APK	**14**	**606,232**	**884**	**234**
AX3SM	**21**	**150,788**	**360**	**149**
AX4FH	**A**	**260,960**	**642**	**140**
AX4DO	**14**	**42,780**	**172**	**93**

Guam

KG6ASP	**A**	**176,911**	**474**	**127**
KG6AQY	**28**	**1,096,275**	**1710**	**235**

Hawaii

KH6IJ	**A**	**1,117,831**	**2551**	**143**
KH6GLU	**28**	**268,392**	**755**	**168**

Midway Is.

KM6DQ	**21**	**162,833**	**502**	**113**

New Guinea, Terr.

VK9GN	**A**	**2,057,160**	**2227**	**316**

New Zealand

ZM4BO	**14**	**637,054**	**899**	**253**
ZL1AGO	**7**	**17,340**	**74**	**51**

Papua Territory

VK9RY	**A**	**77,700**	**358**	**74**

Philippines

DU1FH	**A**	**1,065,565**	**1411**	**265**

Samoa, American

KS6DH	**A**	**921,698**	**1484**	**214**

SOUTH AMERICA

Argentina

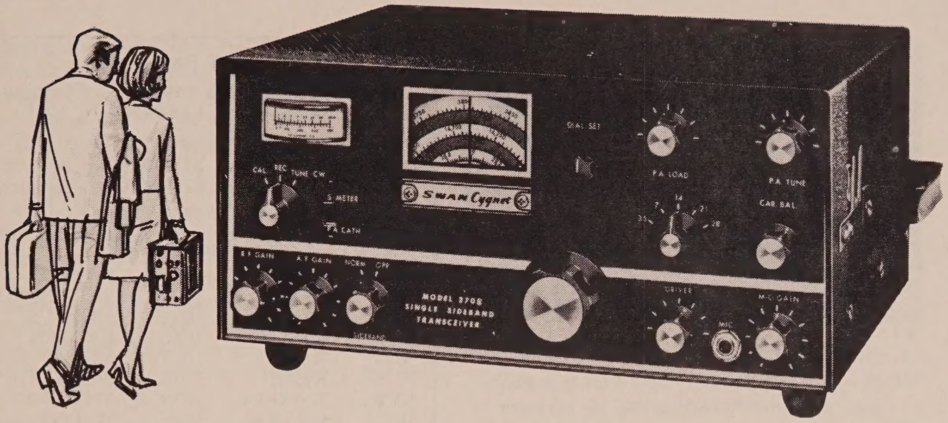
LU4MBI	**A**	**62,540**	**232**	**106**
LU2FAO	**28**	**95,064**	**330**	**102**

Brazil

ZZ1CAD	**A**	**776,910**	**1010**	**282**
XV2CK	**A**	**685,078**	**877**	**281**
ZW3APH	**A**	**594,080**	**975**	**235**
ZY7AF	**A**	**551,511**	**893**	**233**
ZY1CLI	"	196,667	414	193

[*Continued on page 86*]

The multi-multi entry from Japan was the EXPO '70 station, which some of you may have been lucky enough to visit. That's JA3USA at the operating position.



CAL
REC
TUNE CW
S METER
PA CATH
SWAN Cygnet
DIAL SET
PA LOAD
PA TUNE
CAR BAL
R.F. GAIN
A.F. GAIN
NORM
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TRANSCEIVER
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The new SWAN 270B transceiver has the same . . .

- UNEXCELLED PERFORMANCE
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- PORTABILITY
- 260 WATT P.E.P. RATING
- 5 BAND COVERAGE
- FINEST CRYSTAL FILTER
- CRYSTAL CALIBRATOR
- BUILT-IN SPEAKER
- AND AC POWER SUPPLY

. . . as the Swan 270

BUT IT'S NEW LOW PRICE IS ONLY $499

This price reduction has been achieved by making 12 volt DC operation an optional plug-in accessory. The DC components are now contained in a 1½ x 3 x 4 inch box which plugs in back of the 270 B, in place of the AC connector. Servicing and maintenance are made easier, and we are able to pass the savings in cost on to those of you who do not require 12 volt operation. The DC converter, model 14A, may be purchased at any time. Except for this difference, the 270 B is identical to the 270. It is truly a top notch performer and an even better value. See the new 270 B at your SWAN dealer today.

Model 270 B	**$499**
Model 14A, 12 volt DC converter	**$39.50**

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DX

BY JOHN A. ATTAWAY,* K4IIF

> *"For how many things, which for our own sake we should never do, do we perform for the sake of our friends."*
>
> —Marcus Tullius Cicero

THE *CQ* DX Awards Advisory Committee has named another outstanding amateur to the DX Hall of Fame. In recognition of many years of support to DX through provision of gear to DXpeditions and organizing one of the largest QSL handling operations in the history of amateur radio, the DX Hall of Fame plaque was presented to Stuart Meyer, W2GHK, on Oct. 31, 1970 at the Roanoke Division ARRL Convention in Raleigh, N.C. Presentation of this plaque was the highlight of the DX forum.

Stu Meyer kicked off his famous DXpedition of the Month operation in the spring of 1963 when he sponsored Bill Hempel's stint from Ocean Island during the interval May 14–June 21. Shortly thereafter Bill opened up from Nauru Island (June 23–July 19, 1963) as VK9-BH again using equipment provided by Stu and with W2GHK as his QSL Manager.

In the succeeding 8 years the DXpedition of the Month (DOTM) has provided QSL service for upwards of 150 rare stations operating in over 80 countries. Several bulletins are published each year to provide news of DOTM operations and maintain an up-to-date listing of all stations for which logs are available. These may be

The WAZ Program

The following list is based on applications received between Oct. 1 and Oct. 31, 1970.

S.S.B. WAZ

819	W4AUH	822	CP5AD
820	WA3JDA	823	JA1EOD
821	JA3EMU	824	WA6TAX

C.W.—Phone WAZ

3020	K2AHQ	3033	PA0PHK
3021	K6DYQ	3034	YU4EBL
3022	DL8YR	3035	YU3TCB
3023	DJ6LV	3036	PY5ASN
3024	K6GAK	3037	VE3XQ
3025	K6ZIF	3038	K2LGJ
3026	WA8EDC	3039	YV1PP
3027	OY5NS	3040	W3POE
3028	I1JX	3041	UA3NG
3029	I1IJ		UA1ZX
3030	W2FPM	3043	UP2CT
3031	W6MI	3044	K8ZBY
3032	OK2BOB	3045	WB2HNO

Phone WAZ

447........W9KAS

Complete WAZ rules are shown on pages 64-66 of the June, 1970 issue of *CQ*. Application blanks may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Fl. 33880.

DX Hall of Fame

Gus M. Browning, W4BPD
Nov. 1, 1967

John M. Cummings, W2CTN
March 23, 1968

Stewart S. Perry, W1BB
August 16, 1968

Richard C. Spenceley, KV4AA
March 1, 1969

Danny Weil, VP2VB
Sept. 15, 1969

H. Dale Strieter, W4DQS
May 23, 1970

Stuart Meyer, W2GHK
Oct. 31, 1970

Presentation of DX Hall of Fame Award to Stuart Meyer, W2GHK/4, by CQ DX Editor, John Attaway, K4IIF. The occasion was the DX Forum of Roanoke Division Convention, Oct. 31, 1970, in Raleigh, North Carolina. *(Photo courtesy Al Browne, WN4PZX).*

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*P.O. Box 205, Winter Haven, Fl. 33880

obtained by sending a self-addressed, stamped envelope to P.O. Box 17316, Raleigh, North Carolina 27609.

Congratulations Stu on a job well done.

During the past 3 years over 20 of the world's foremost DXers were nominated for the ultimate honor, DX Hall of Fame. The CQ DX Awards Advisory Committee considered that of this date, the above were the only individuals truly qualified. As most of the other nominees are not presently adding to their accomplishments, this list appears destined to stand as is for a time. However, the Committee is always willing to reopen a file or to consider new nominees when evidence is presented indicating that such a move is in order.

De Extra

We recently visited the office of Bill Grenfell, W4GF, at the FCC in Washington. Bill is very high in the Amateur and Citizens Division and also an outstanding DX and Contest operator. He expressed concern that amateur radio in the U.S. is standing still, while in many other countries it is growing vigorously.

There are many reasons for lack of growth of ham radio in our country. However, excuses are no longer interesting. What we need are some good concrete programs to get things going again.

This column volunteers as a clearing house for ideas. Let us know your thoughts. We are more than willing to publicize a good suggestion and help you with a petition to the FCC if such is in order.

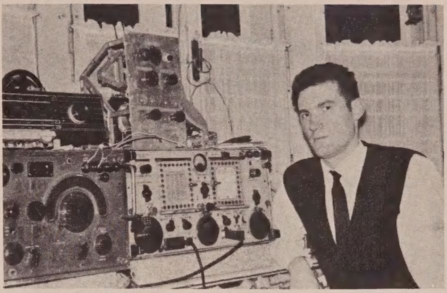
QRP News

Ade, K8EEG/0, Editor of *The Milliwatt*, reports that many DX stations have inquired about the magazine as a result of publicity in this column. Stateside QRP nuts are very interested in their DX counterparts and invite the DX minipower boys to send info on their accomplishments to *The Milliwatt* for publication. Ade's latest bag is European contacts on 40 meters at the 1 watt level.

Subscriptions to *The Milliwatt* are now being handled by the new Business Manager, Wes Mattox, K6EIL/2, 115 Park Ave., Binghamton, N.Y. 13903.

QRP ARC International

An earlier issue contained out-of-date information on some of the officers of QRP ARC I. The Corresponding Secretary who handles all inquiries and membership applications is Elmer J. Worth, K3YNN, 946 Franklin Street, Reading, Pa. 19602. The General Secretary is Robert L. Jenks, K7ZVA, 11714 Masonic Rd. SW, Tacoma, Wa. 98498, and the Awards Manager is Hugh F. Aeiker, WA8CNN, 929 South Park, Charleston, W. Va. 25304.



An enthusiastic prefix chaser, Ivan, YU2OB. This OM is a frequent participant in the CQ Worldwide DX contests.

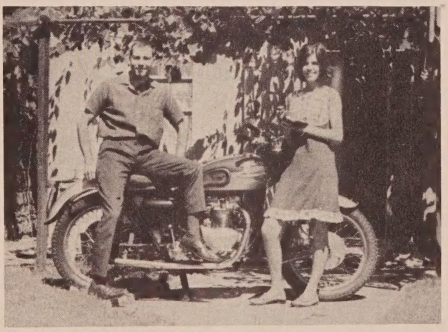
Amateur Radio in Indonesia

Information for this month's feature is courtesy Henri Wilson, YB3DC, of Surabaja, Indonesia.

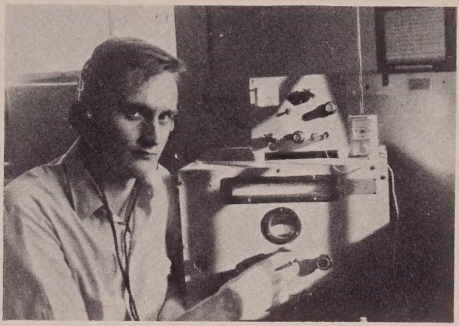
"Our national amateur radio society is called Organisasi Radio Amatir Republik Indonesia, abbreviated ORARI, which in English means Organization of Radio Amateurs of the Republic of Indonesia. It has its headquarters in Djakarta, and is directly controlled by our governmental Communication Department, corresponding to your FCC, which issues the licenses.

"ORARI has local sections in each of the call areas which are geographical subdivisions similar to your own. The 0 area is Djakarta, the YB1 area is all west Java except Djagarta, the YB2 area is middle Java, the YB3 area east Java, and the YB4 area south Sumatra. There are a few stations in the 6 and 7 areas on Kalimantan Island which you call Borneo, and a YB9 in West Irian. There are 2000 registered hams in all, but only about 20 are operating in the international bands.

"Indonesia has 3 classes of amateur licenses, and they can be distinguished by prefix. YB indicates the upper class license, YC the middle



Manuel Castelo, CX9BT, and 2nd c.w. operator Maynes, of Montevideo, Uruguay. These enthusiastic DXers can frequently be heard on 14-28 mc c.w. and s.s.b. using a homebrew phasing type transmitter and a 3-band quad. The motorcycle is for when the ham bands are dead.



VP2GBR, Dave (G3UUR), Grenada, W.I. who put this rare spot on the 160 meter DX Map for the first time ever by QSOing W1BB. *(Photo courtesy W1BB).*

class, and YD the lower class. Indonesian citizens have 2 letters after the prefix which are assigned in order: YB1AA, YB1AB, YB1AC, etc., while foreign hams with reciprocal licenses have 3-letter calls such as YB1AAB.

"YB, upper class, may use both phone and c.w. on all amateur bands with a maximum of 500 watts DC input. They must know English, have a code speed of 18 w.p.m., and be well-versed in radio technology. YC, middle class, may use both phone and c.w. on all amateur bands except 20 meters with a maximum of 75 watts d.c. input. They must have a code speed of 12 w.p.m., know English, and be technically competent. YD licensees may only use 80 meters and cannot contact amateurs in other countries. They may use both phone and c.w. but are limited to a power of 10 watts d.c. input. Their code requirement is only 5 w.p.m.

"The biggest problem in our country is material. Due to the shortage of parts only about 10 of our hams are using s.s.b. Back issues of *CQ* and other US amateur magazines are highly prized. My home club, the Surabaja club, is very fortunate in having a sponsoring club in Honolulu. They send us extra parts, books, and magazines. Many thanks to those very nice OM's, particularly Frank Baker, Jr., KH6CXP.

"Our main QSL bureau is P.O. Box 2761 in Djakarta, but some clubs have their own boxes. For example, all YB3 cards go to P.O. Box 59 in Surabaja.

"At the present time we have reciprocal operating agreements with only the United States and Germany.

"Please tell everyone who hasn't yet received a YB3DC QSL card to please be patient. I am still working through the pile."

Here and There

New Indiana Award Checkpoint: The Indianapolis Radio Club now has a representative on the *CQ* DX Awards Advisory Committee and is an authorized checkpoint for Hoosier DXers wishing to apply for WAZ and the new *CQ* and S.S.B. DX Awards. The new Committeeman is club president Ron Williams, W9JVF. Ron may be reached at 1849 E. 49th. St., Indianapolis, Indiana 46205.

The WPX Program

S.S.B. WPX

552........WB2IBD
553........LU2FAO
554........CR6LF
555........VE3GCO
556........W6RGG
557........WA1KYW
558........WB2KHO
559........F5XA
560........K5VYT/4
561........DL8EJ
562........UW3CW
563........UQ2KFG

C. W. WPX

1062........DL8IH
1063........VE3GCO
1064........LZ1KAA
1065........K4KSB
1066........W7IVO
1067........SP5BAK
1068........WB5KJE
1069........UW3RY

Phone WPX

Mixed WPX

254........VE1AI
255........JA4BJO
256........K9YXA
257........WBKZG
258........W9DY

WPNX

24........WN9CBY

VPX

27 (S.S.B.)........WDX2PQA

WPX Endorsements

S.S.B.: W4OPM–1000, WA5LOB–700, F2-MO–650, CR6LF–600, VE3GCO–600, W8GKM–500, WA6TAX–500, WA2CCF–400, W4WSF–400, LU2FAO–350, K9-HDZ–300, WA1KYW–300, UQ2KFG–300, W9KAA–250, and DL8EJ–250.

C.W.: W0AUB–750, W4IC–600, W0BK–600, W2MLO–500, W0TOR–450, LZ1-KAA–450, UA6KAE–450, OK2BLG–450, UA3GO–450, W6ANN–450, W9-OYZ–400, VE3GCO–350, and UB5KJE–350.

Phone: CT1HF–800, CX2CN–650, W8-PQD–450, and W2LEJ–450.

Mixed: W4OPM–1150, W9DY–800, W4IC–750, WA5LOB–700, JA4BJO–600, W4-WSF–550, and WA3GNW–450.

80 Meters: DL8EJ.

20 Meters: VE3GCO and W4WSF.

15 Meters: VE3GCO.

Africa: W9DY and W4WSF.

Asia: W9DY.

Europe: DL8IA, W9DY, SP5BAK, and DL8EJ.

North America: W9DY.

Oceania: W9DY.

South America: W9DY.

VPX: 500–OH2-829, 250–SM4-3958, 250–W4-10646.

Complete rules for WPX, WPNX, and VPX are shown on pages 66-67 of the June, 1970 issue of CQ. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, Ca. 91722, or to the DX Editor.

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the CQ WPX Master Prefix List. Scores are based on the current prefix total regardless of an operators all-time prefix count.

MIXED

W4OPM	Joe Hiller	1000
W9WHM	John R. Leary	811
W8LY	Michael A. Bakos	785
K1SHN	Chuck Banta	746
K0BLT	Frank Cahoy	733
W8ROC	Frederick Riecks	729
G3DO	D. A. G. Edwards	721
W0AUB	Bill Bergmann	719
VE3GCO	Garry V. Hammond	713
W3PVZ	Joheph M. Olnick	707
W4IC	George A. Mack	707
WA5LOB	James Edwards	699
I1SF	Serafino Franchi	690
CT1LN	Paulo J. S. Coelho Vieira	652
DL1MD	Heribert Rechl	646
W4BQY	G. B. Fisher	639
WA6EPQ	Larry Brockman	617
YU1AG	Djura Borosic	614
W8KSR	Jon Hodgin	609
W4CRW	Robert Sommer	604
W8GMK	John Marhefka	592
WA0CPX	Edward C. Gray	550

SSB

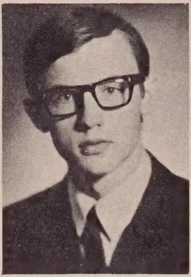
W4OPM	Joe Hiller	899
W4NJF	Gay E. Milius	857
WA5LOB	James Edwards	692
DL9OH	Karl Muller	690
K2POA	Arthur Johnson	683
HP1JC	Juan G. Chen	644
F2MO	Michel Dort	632
K1SHN	Chuck Banta	626
G3DO	D. A. G. Edwards	622
W3DJZ	Arden B. Hopple	620
I1AMU	Alfonso Porretta	619
I1KDB	Giampaolo Nucciotti	599
W4IC	George Mack	562
W6YMV	Paul Friebertshauser	553

CW

W4OPM	Joe Hiller	850
W8KPL	William Simpson	816
W8LY	Michael A. Bakos	786
W2AIW	Charles Rodgers	776
DL1QT	Helmut Baumert	764
VK3AHQ	Henry Denver	753
W2HO	W. Vollkommer	720
ON4QX	Bob Berge	682
W9FD	W. W. Johler	680
WB2FMK	Robert J. Rasche	628
G2GM	F. D. Cawley	627
K1SHN	Chuck Banta	611
VE4OX	D. E. McVittie	579
I1SF	Serafino Franchi	571
YU1AG	Djura Borosic	569
W8GKM	John Marhefka	562
OK2QX	Ing. Jiri Pecek	556
K1LWI	Wendell Boyden	550

PHONE

W9WHM	John R. Leary	813
G3DO	D. A. G. Edwards	708
W3DJZ	Arden Hopple	654
CX2CN	Samuel Barreiro	624
CT1LN	Paulo J. S. Chelho Vieira	619
I1SF	Serafino Franchi	568



Vilius Vasheikis, UP2PX, of Kaunas, Lithuania. "Willy" is chief operator of club station UP2KBC. QSL these stations via W3YI. *Photo courtesy K3OLG).*

For a complete listing of *CQ* Committeemen authorized to verify cards see page 63 of the December, 1970 issue.

International Medical Net: On Wednesday's, Dr. Glen Eschtruth, 9Q5GE, and others have organized an international medical net. If interested listen for Glen on 12385 kc at about 1800 GMT.

Fresno DX Convention: The big event is Jan. 30 & 31, 1971. Registration information is available from Frank Glass, K6RQ, 14910 Bascom, Los Gatos, Ca. 95030.

New EI-Bureau Address: The Irish Radio Transmitters Society Bureau can now be reached at P.O. Box 462, Stella Ave., Dublin, Ireland.

Rare Countries Heard

In deference to the c.w. and s.s.b. DX awards we are covering rare countries this month instead of rare zones. Call signs and reported frequencies are given.

C.W. Log

BV, Formosa: BV2A–14055 and 14022 kc.

CE9, South Shetlands: CE9AN–14083 kc.

CR3, Portuguese Guinea: CR3KD–14095 kc.

CR7, Mozambique: CR7AW–18046. CR7FM –28012 kc.

EA6, Balearic Is.: EA6BD–14013 kc.

GD, Isle of Man: Operations are planned for the Feb-March DX tests by G3YBH and K6TWT /G5ATG. The c.w. call will be GD5ATG. QSL to K6TWT.

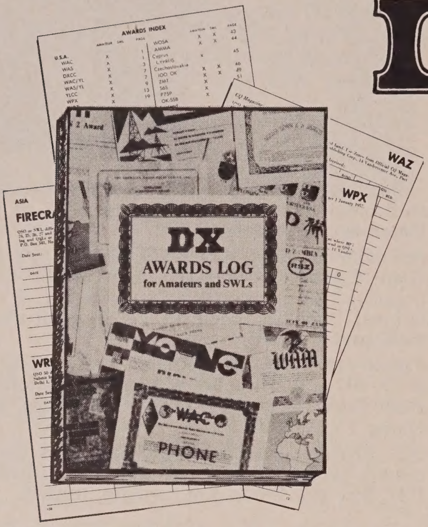
HS, Thailand: HS3MB–21005 kc.

[*Continued on page 82*]

Dick Moen, W7VRO, 3rd winner of the Scott's QSL Service Award for outstanding QSL managers. Dick has been a manager for 4 years and has sent out over 30,000 cards. He now handles the following stations: CR7IK, HM1AB, HM9AB, KR6MB, KR6NG, KZ5GN, OD5EE, PY2BGL, YB9AAJ, ZS1XR, 5N2AAF, 5H3KJ and 5H3KJ/A.

A MUST FOR EVERY DXER

DX AWARDS LOG



This fabulous book sells for $3.95 anywhere in the U.S. and is available for immediate delivery from the CQ Technical Library. However, with any subscription to CQ you can obtain a copy of the *DX Awards Log* for just $1.50 (a $2.45 savings). To obtain your DX Log at the discount price it must accompany a subscription order to CQ, but that order can be for renewals or extensions as well as for new subscriptions.

SUPPLY IS LIMITED—ACT NOW!
Without subscription, cost price is $3.95.

This new 150-page log book has been published for use by all DX'ers to keep an organized log of contacts and confirmations for the many DX awards now available.

Complete details are provided on the number and type of contacts needed for over 100 major awards made by amateur radio clubs throughout the world. In addition to specific award qualifications and costs, the method of confirmation and how and where to apply are also listed under each individual award.

Special individual logs are set up under each award providing space for a complete record of contacts and confirmations including log data required to be submitted with the award application.

The *DX Awards Log* required over two years preparation in order to contact radio clubs throughout the world for the latest data on awards currently being offered. It is the most complete and up-to-date source for such information. It will be invaluable to the "wallpaper collector" as well as any amateur of SWL making DX contacts.

Circulation Department, *CQ* Magazine
14 Vanderventer Ave., Port Washington, N.Y. 11050

Gentlemen:

Your offer is too good to miss. I have indicated my preference below. (Payment must accompany order.)

NAME..CALL..............................

ADDRESS..

CITY..............................STATE......................ZIP.......................

I want the DX Awards Log with a *CQ* subscription for:
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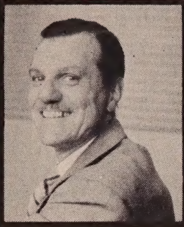
☐ I just want the DX Awards Log at $3.95

☐ New Subscription ☐ Renewal ☐ Extension



Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Jan. 30-31	**CQ WW DX 160 Contest**
Jan. 30-31	French C.W. Contest
Feb. 6-7	ARRL DX Phone Contest
Feb. 7&13	1st World SSTV Contest
Feb. 13-14	QCWA QSO Party
Feb. 14&20	Giant RTTY Flash Contest
Feb. 20-21	ARRL DX C.W. Contest
Feb. 20-28	IARC Propagation CW/ RTTY
Feb. 27-28	French Phone Contest
Feb. 27-28	YL-OM Phone Contest
Feb. 27-28	Vermont QSO Party
Feb. 27-28	"Operation's Day"
Mar. 6-7	ARRL DX Phone Contest
Mar. 13-14	YL-OM C.W. Contest
Mar. 13-15	BARTG RTTY Contest
Mar. 20-21	ARRL DX C.W. Contest
Mar. 27-28	**CQ WW WPX SSB Contest**
Apr. 3-4	SP DX Contest
Apr. 3-11	IARC Propagation Phone
*Apr. 17-18	Helvetia XXII Contest
*Apr. 24-25	PACC DX Contest
May 21-23	YL Inter. SSBers QSO Party

*Tentative date, not official

YL-OM Contest

Phone: Feb. 27-28 **C.W.:** Mar. 13-14
Starts: 1800 GMT Saturday
Ends 1800 GMT Sunday

Rules in last month's CALENDAR. However there is a correction in the Awards. Certificates will be awarded in each USA & Canadian call areas. (not ARRL section)

Logs go to: Mae Hipp, K7QGO, 5655 Yukon Drive, Sparks, Nevada 89431.

World Wide SSTV Contest

Two Periods:
0700-1400 GMT Sunday, February 7
1600-2300 GMT Saturday, February 13

Here's a new one for you sponsored by *CQ Electronica* of Italy, to promote interest in Slow Scan TV. We don't know how this one is going to work out but the procedure is to exchange pictures with other stations. The message number may be given by voice.

Scoring: One point for each two-way exchange and a multiplier of 5 for each continent worked. (No extra credit for contacting same station on different bands)

Frequencies: 3740, 7050, 14230, 21100, 281-000, plus or minus 5 kcs.

Logs: Must contain date/time in GMT, band, call, message sent/received and points.

Awards: 1st, silver thaler of Maria Theresa; 2nd, a 12 month subscription to *CQ Electronica;* 3rd, a 6 month subscription and 4th a special s.w.l. prize to those who do not have transmitting equipment but submit the best collection of photos of SSTV pictures in the contest.

Mailing deadline is February 28th to: Prof. Franco Fanti, I1LCF, Via Dallolio 19, 40139 Bologna, Italy.

Giant RTTY Flash Contest

Two Periods:
0700-1500 GMT Sunday February 14
1500-2300 GMT Saturday, February 20

This is the 3rd annual contest sponsored by *CQ Electronica* of Italy. All bands 3.5 thru 28 mc may be used. The ARRL country list and CPR zone boundries are the standards for scoring.

Exchange: RST and zone number.

Points: Contacts with stations in own zone, 2 points. Contacts with other zones, score points as listed in Zone Exchange Point Table.

Multiplier: One for each country worked on each band. Own country cannot be counted.

Scoring: Total QSO points multiplied by the sum of countries from each band. (The same station may be worked once on each band for QSO and Multiplier credit)

Awards: Will be made in three classifications. General, those using less than 100 watts and s.w.ls. 1st, 2nd and 3rd in each class will receive gold, silver and bronze medals respectively; 4th to 7th a 12 month subscription to *CQ Electronica;* and 8th to 10th a 6 month subscription.

Use a separate log sheet for each band. Indicate time in GMT, call, number sent/received, country and exchange points.

Logs must be received by March 20th and go to: Prof. Franco Fanti, I1LCF, via A. Dallolio 19, Bologna, Italy.

IARC Propagation Contest

CW/RTTY: February 20 to 28.
Phone: April 3 to April 11.
Starts: 0001 GMT. Ends: 2400 GMT.

---

*14 Sherwood Road, Stamford, Conn. 06905.

Claimed Scores
1970 CQ WW DX Phone Contest

Single Operator **All Band**	
KH6RS	3,595,049
EP2BQ	1,799,450
W2PV	1,597,278
EL2CB	1,396,720
DL5JF	1,308,236
XE0QB	1,158,099
K4BVD/6	1,046,639
KR6AY	967,840
KC6RS	966,288
K1ZND	874,400
ON5GQ	755,585
28 mc	
LU5FEH	307,700
KP4DDO	293,102
K4KJN	240,948
WA1HFN	239,839
WA8QIY	179,388
VE3GCO	150,164
W1BIH	146,588
W8IMZ/8	145,656
W7IR	143,967
W4CRW	105,000
21 mc	
KH6IJ	516,061
PY4KL	379,008
W1RIL	346,495
W6HX	274,784
K6SVL	270,000
VE2AFC	201,426
W4NQM	180,285
WA3JES	123,468
14 mc	
W2ONV	694,212
EL2CK	379,506
KC6WS	364,818
I1PRK	246,560
TG9GF	207,345
CR7FR	203,680
W3BWZ	152,694
W9IOP	137,566
W6GRV	102,564
K6YRD	101,388
7 mc	
KH6GLU	64,437
K2GXI	44,978
SM0AJU	9,320
WA0ETC	8,003
DJ6LV	7,791
YT2REY	3,822
3.5 mc	
LA0AD	80,754
WA3LKH/3	9,861
OK2BLI	6,786
W2SKE	4,182
Multi-Operator **Single Trans.**	
PJ9AF	4,800,000
HH9DL	3,500,000
W3WJD	1,470,000
W6MAV	1,182,474
WA6GLD/6	1,167,360
WA0TJJ	283,230
Multi-Operator **Multi-Trans.**	
DK0WA	6,000,000
4Z4HF	5,500,000
W6VSS	5,100,000

The IARC calls this "a DX contest with a purpose." The objective being to work stations in as many different CPR Zones and Prefixes as possible. The official list of CPR zones and ITU prefixes to be used.

Exchange: RS/RST plus your CPR Zone.

Points: Fixed to fixed station, same zone, 0 points; different zone, 1 point. Fixed to mobile, same zone, 1 point; different zone, 4 points. Mobile to fixed, same zone 2 points; different zone, 4 points. Mobile to mobile, 4 points.

Multiplier: Score 1 for each Zone worked, and 1 for each new prefix worked on each band and each mode. (Credit Zone only once, Prefix once on each band and mode)

The same station may be worked as many times as desired. Contacts lasting more than 6 minutes may be credited as a separate QSO but each must be logged separtely to receive credit.

Scoring: Multiply total QSO points by the Zone plus Prefix multiplier.

Note: Contacts with stations operating in other contests may be credited provided the correct IARC Zone is exchanged.

Use official IARC log forms or a facsimile with 40 QSOs to page, and indicate new Zones and Prefixes as worked, the first time *only*. Use separate log sheet for each band and mode.

Awards: Certificates to winners in each Zone.

Logs go to: L. M. Rundlett, 2001 Eye Street, Washington, D.C. 20006.

Vermont QSO Party

Starts: 2300 GMT Saturday, February 27
Ends: 0300 GMT Monday, March 1

The Central Vermont ARC again offers this opportunity to work this comparitively rare state and countries for WAS, 5BWAS, WANE, W-VT, and USA-CA awards. The same station may be worked on each band for QSO and multiplier credit.

Exchange: QSO nr., RS/RST and QTH. County for VT., ARRL section for others.

Scoring: Vermont, total QSOs multiplied by ARRL sections and countries worked.

Others, 3 points per QSO multiplied by number of Vermont counties worked on *each* band. (max. of 14 per band) Phone and c.w. segments considered same band.

Frequencies: 3685, 3932, 3909, 7060, 7265, 7290, 14060, 14290, 14325, 21060, 21375, 28100, 28600, 50.260, 50.360, 144 thru 144.5, 145.8 and Novice frequencies.

Awards: Certificates to the top scorers in each ARRL section, 1st-4th places in Vermont and multi-operator stations. There is a Trophy for the Top Vermonter and the Top station outside Vermont get a suitably inscribed gallon of pure Vermont maple syrup. (Get the pancake batter ready)

Stations working 13 out of the 14 Vt. counties will receive the "Worked Vermont" certificate if it has not been previously issued.

Mailing deadline is March 31st to: CVARC, c/o E. Reg. Murray, K1MPN, 3 Hillcrest Drive, Montpelier, Vermont 05602. Include a s.a.s.e. for copy of results.

World RTTY Championship

The *CQ Elettronica* magazine is also awarding a Plaque to the World RTTY Champion. Scores from the several RTTY contests for the past year will be totaled according to your position in those contests. It is not necessary for you to send an entry. Check with Prof. Franco Fanti, I1LCF, if you think you might be eligible.

Operation's Day

Starts: 1300 GMT Saturday, February 27
Ends: 0100 GMT Sunday, February 28

The boys of the Colonie Central High School Radio Club will man four rigs at their club station WA2DNR during the above period. A special QSL card will be sent to every station contacted during that time.

Activity will be on phone on the following frequencies: 3905, 7275, 14255, 14280, 21300, 21360. And novices on 7175, and 21140.

Send your QSL card to Colonie Central High School Radio Club, 100 Hackett Avenue, Albany, N.Y. 12205.

CQ World Wide WPX SSB Contest

Starts: 0000 GMT Saturday, March 27
Ends: 2400 GMT Sunday, March 28

Note the new date, the last full week-end in March will now be the time of this Contest.

Rules are the same as last year. A few points to keep in mind are as follows:

1. QSO point values.

(a) 3 points for contacts between stations on different continents

(b) 1 point between stations on the same continent but different countries.

(c) No points between stations in the same country, but allowed for multiplier credit.

(d) Exception: Contacts between stations within the North American boundries will count 2 points

(e) Contacts on the 40, 80, and 160 meter bands will have *double* the above values.[1]

2. Prefixes are used as the multiplier. And a prefix may be used only *once* in the contest. (Not on each band)

3. There is a time limit for single operator stations. Only 30 hours out of the 48 hour contest period may be used for contest credit. .The non-operating time can be taken in up to 5 periods totaling 18 hours, anytime during the contest period. There is no time limit for multi-operator stations.

Complete rules in next month's issue.

Logs of course go to: CQ, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

Editor's Notes

Conditions for the Phone Contest week-end were rather good, as the list of Claimed Scores indicates. Please bear in mind that the list is only a cross-section of some of the "early bird" logs received the first few days after the contest. Some were over the air reports and have no bearing on what the final score will actually be.

We are amazed as to the way the 10 meter band is holding up. Evidently the falling off of the sun spots is a gradual process and we will have 10 with us for a little while yet. WWV was sending N6 for most of the contest period, there were a couple of U6 reports, so I would say that George Jacobs has called another one on the nose.

Concerning the CPR Zone list and QSO point table being used in the IARU and RTTY contests They are quite space consuming and we are not able to reproduce them here. However we do recommend that you write to the respective contest chairmen and have them supply you with the necessary information.

73 for now, Frank, W1WY

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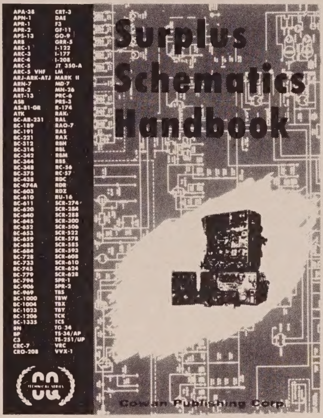
[1] A new ruling by FCC prohibits US phone contacts on 40 meters with stations outside Region II or, basically, the Western Hemisphere. US stations should keep this in mind particularly during the heat of contest activity.

SURPLUS

CQ TECHNICAL SERIES

SCHEMATICS HANDBOOK



Partial list of contents:
ARC1
ARC3
ARC5
ARC7
ART13
BC189
BC344
BC610A
BC640
BC728
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SCR274
SCR284
SCR506
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Q AND A

BY WILFRED M. SCHERER.*
W2AEF

In the event that you've sent a question to our *Q & A* man, Bill Scherer, W2AEF, and have not yet received a reply, please bear with us. Bill's been under the weather for a while now, and our efforts to keep the letter-stack down to reasonable proportions have met with only partial success. By the time you read this, W2AEF will be back at the old task of making life easier for the ham with a technical problem. *–Editor.*

Inverted Bandspread

Question: I installed a 5-25 mmf variable capacitor in parallel with the 490 mmf main tuning capacitor in my receiver to use as a Bandspread control. However, at minimum capacity, the Bandspread capacitor tunes lower in frequency instead of higher. Why?

Answer: The Bandspread capacitor should work properly (lowest frequency with maximum capacity) provided the leads from the 5-25 mmf capacitor to main capacitor are very short. If this is not the case, spurious oscillations may be taking place or the in-inductance of the long leads may be placed in parallel with the oscillator inductance as the bandspread capacitance is increased, causing the frequency to rise instead of drop.

4th Harmonic of 15 Meters

Question: How can I eliminate the 4th Harmonic of 15 meters. It is killing Channel 6 in my area and I need a little better relations with the neighbors. I am using a Drake TR-4.

Answer: The addition of a low pass filter should help the situation. If not, check all antenna and cable connections to make sure they are not corroded. Corroded joints make excellent harmonic generators, under certain circumstances. You might also be exciting other corroded or loose connections in the area which will rectify or generate harmonics. These would have to be tracked down individually. Using a dummy load first at the transmitter, then at the antenna end of the feedline will localize the problem area, and also ensure that the interference is from direct radiation and not directly through the a.c. line or from the transmitter itself.

Heath DX-40 Spurious

Question: I have a Heath DX-40 that caused me to receive a QSL from the FCC because of a spurious signal on 7040 kc while operating on the 40 m. Novice band. I tried parasitic suppressors at the plate and grid of the final without success. What do you suggest?

Answer: Make sure that the final amplifier is properly neutralized and stable, and if possible, replace the driver and final tubes. Listen to the spurious on a receiver and see if it can be eliminated by slightly de-tuning the oscillator plate circuit, the driver or the final amplifier. The trouble may be in the oscillator. Try another crystal, (the one you are using may be defective). If the replacement crystal is on a different frequency, look for the spurious signal on a different frequency. If the trouble is in the oscillator, changing the oscillator tube may clear it up.

One Good Turn

Jim McMechan, W0PFP, who supplied us with the coil data for the CE 10A/10B that many of you wrote in for now needs a helping hand. He is looking for the manuals and diagrams for Instrument Corporation of Florida Models R-500 and R-500-1. These are a v.l.f. receiver and phase comparator. If any of you have the data send it to Jim or to me and I will forward it.

Quiet Coax Relays

From W9HEE comes this little trick for quieting a.c. operated coax relays. The simple half-wave rectifier/filter system occupies little space, and costs a great deal less than a new relay.

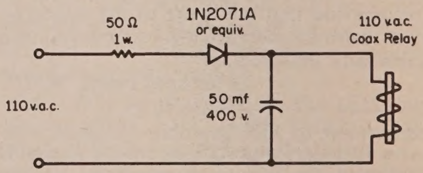

Fig. 1—Simple half wave rectifier and filter circuit used to quiet a.c. operated coax relays.

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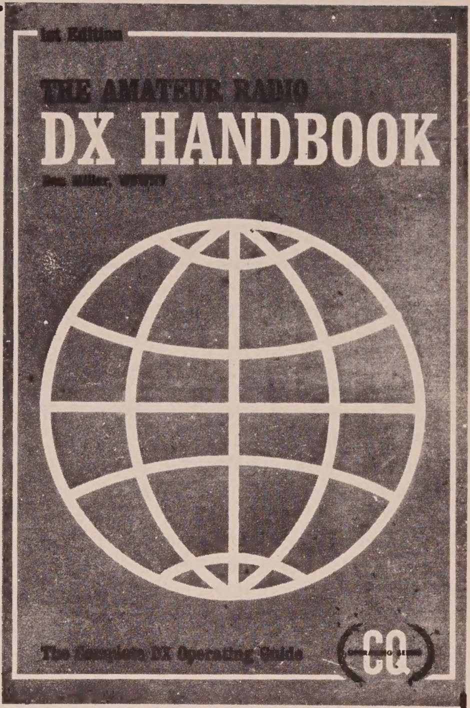
*Technical Director, *CQ.*

WHAT'S TO KNOW ?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Instant Service Nets
WCARS—MWARS—ECARS

BY ED GRIBI,* WB6IZF

BACK IN THE SADDLE—Sure tough to tear myself away from 20 meters, but want to keep everybody up to snuff on my favorite 40 meter Services (been writing so many cables and telexes these last few weeks I find I'm writing in cablese—sorry). Anyway, these blessed Singapore Wireless Inspectors visited the flat on 3 August and the same day I was back on the air as 9V1QF. Before issuing a license the Inspectors check your shack, including antenna and ground systems, for safety and technical quality of equipment. They were properly impressed by my 270, and r.f. into the dipole showed no lines on the TV. The inspection is something that could be used in W/K land. Of course, in some instances I feel a psychiatric test might be more meaningful. Reciprocal in Indonesia has started again, so I hope to have YB8 on the air by the time you read this. That will be a rare prefix for a non-DX man like me to use!

P. S.—Instant Service to the public and other amateurs is the watchword of the three CARS, but it certainly is not their exclusive property. All amateurs who provide public service are providing instantaneous communications that are unique because of the capabilities and flexibilities of amateur radio. Instant service for public service—and here's a description by 9V1NQ of what we're trying to do from *Suara Singa*, Quarterly of the Singapore Amateur Radio Transmitting Society:

"Public Service—Amateur radio has provided emergency communications during earthquakes, floods, hurricanes and other disasters. In some countries, amateurs have set up emergency corps in co-operation with the International Red Cross and their countries. Time and time again amateurs have provided emergency networks when other forms of communication have failed and in fact were sometimes the first to summon for assistance for disaster areas."

Here's a good example of that P. S. in action on an international scale: Jens Jensen, W4AMG/MM and his wife, Keiko, aboard the 36′ cruising sloop *Exodus* crossing the Indian Ocean last May lost their mainsail in a storm. They tried to run for an island in the Maldives using the auxiliary but, in the heavy seas, were getting low on fuel far short of safety. Jens was maintaining daily 20 meter c.w. skeds with Stan, 9V1PA, and on May 23 advised that he required assistance. VS9MB, club station at Gan, Maldives, was alerted and immediately arranged an RAF search and marine help. The Royal Fleet Auxiliary *Tarbartness* sailed from Gan next morning with fuel and DF equipment. VU2-OLK organized DF equipment on Ceylon and the *Tarbartness* got a transmitter on 14.085 to make the makeshift net complete. Tricky navigation using m.c.w. on the ship and a transistor DF on the *Exodus* enabled contact to be made and fuel to be transferred on May 25. *Exodus* then continued uneventfully into Gan and is presumably now approaching Europe.

I learned of this outstanding amateur

Wayne Nail, 1970 President and one of the founders of WCARS. Yours truly on the left. *(picture by Les Lester, W6LHQ)* effort from an account by Maurice Caplan, VS6AA, in *OHM*, The Oriental Ham Magazine. *OHM* is published in Hong Kong by Pacific Publications, Ltd., and is a bright little entry to the ranks of ham publications. I had a pleasant eyeball with publisher Phil Wight, VS6DR, last summer. It's nice to see a unifying force such as this for hams out here where amateur publications in any language are rare.

---

*Holland Park Flats D No.1, Singapore 10.

ECARS News (from the *Monitor*)

"Rescue Squad" reports: WA1KTY/M called in a three car pileup in Connecticut to W3AES for relay to State Police. W2WSP/M reported a motorist in distress in New Jersey to same W3AES. K5WSF/M spotted a lady lying on a highway divider strip and called in on ECARS–K3WEU and W4NPP got it in to Maryland State Police. W3WIC/M reported a two car accident with injuries on 7255 and K3FEC called Virginia State Police who dispatched an ambulance to the scene. K3FEC called in on 7255 reporting urgent need for an uncommon blood type for a friend. With the aid of K2PJG, W1TWG, VE3DUB, and WB2TUQ the blood was delivered to a Rochester, New York, hospital.

For information on joining EASTCARS, send an SASE to WA1KRN, James R. Lightfoot, Station WBZ, Boston, Massachusetts 02134.

MIDCARS News (from (*Radio Watch*)

W9HEM reported amateur communications back-up during a train derailment and subsequent explosion and fire in Crescent City, Illinois.

The Midcars gang are great for picnics in the summer months in lieu of meetings to thrash out organizational matters. These informal bashes in such places as Benton Harbor, Michigan, and Bloomington, Illinois, draw participants from hundreds of miles for beer and barbeque. Regardless of the format–convention, hamfest, luncheon, or picnic–I've found that these sessions contribute tremendously to the harmony, efficiency, and progress of the Instant Services. For example, a kind of cabin fever sometimes creeps into relations between people who are on the same frequency for hours every day but never meet. The eyeball and 807 can clear the air in a manner impossible by continuing talk and correspondence. Speaking of these sessions–one of the best is the annual SAROC, Flamingo Hotel Convention Center, Jan. 7-10, 1971, Las Vegas–write SNARC, Box 73, Boulder City, Nevada 89109.

For information on joining MIDCARS, send an SASE to K9GPM, Ray Wilson, 25W013 Lacey Avenue, Naperville, Illinois 60540.

WCARS News (from the *Sentinel*)

W6GVC/MM, Russ Mosby, called in on 7255 with a double break which he soon changed to a triple break–the 206 footer near Los Angeles had lost power and was leaking through both shafts. With WB6ABW as NCS and WB6OAO and W6MZO as backup, WA6EVY got the Coast Guard alerted and on the scene in short order. Russ reports that W5UIB/6, W6BVD, K6OAM, W6-MBD, WA6DPP, WB6FFE, W6BH, and WB6YGC were also extremely helpful in related communications concerning the vessel and its occupants. Russ is now in South Africa and I'll be looking for him from here.

Dorothy, WB6OSP, made several toll calls to arrange a flying ambulance of the Flying Samaritans to pick up four injured Americans in Baja California. XE2MMK was on the other end.

And highways–W7CTX/7 triple broke requesting Montana Patrol to the scene of an accident with serious injuries near Missoula–K7UPJ on the scene, WB6MXM made a toll call and the Montana Patrol was on the way within seven minutes. W6NTU requested an ambulance for an injured motorcyclist in back country near Livermore, California–arrived in 40 minutes. K6OPG reported a hit and run accident in San Francisco. W4YAA-/7 called the Nevada Highway Patrol to help WA0QPR broken down in remote eastern Nevada. Many mobiles helped locate W6GZI traveling in Oregon for an urgent situation at home.

VE7BCP called in on WCARS requesting a station in San Francisco to contact HR1-KAS. VE2AQV/6 near San Francisco made a medical information patch to the Honduras station on 14.260 regarding an emergency eye operation.

Will, W6GCL, received a nice letter from the Chief, Los Angeles Police Department, for unusual services via amateur radio. Seems the LAPD and San Francisco PD had a challenge cross country race between their two police teams and the Chief wanted to know the location of their runner on the 534-mile route. WCARS was contacted, Will (probably one of several) got in his mobile, and the Chief had the location pinpointed within an hour. Any time you need help we're here, Chief.

My successor as WCARS Publicity Chairman is Tom, K5BWZ/6. Let him know what you've done. The Instant Service concept has mushroomed well over 1000 percent in the last five years largely because it's an automatic instantaneous way of helping the public and getting some instant satisfaction out of your amateur activities. But it's vital for the good of all amateur radio that these services performed are fully noted and the Publicity Chairman and the *Sentinel* are the places. Same goes for MWARS and ECARS. Speaking of the *Sentinel,* it's nice to see the new offset format and pitchers, yet!

For information on joining WCARS, send a card to Wayne Nail, WB6CBW, 4924 Omar, Fremont, California 94538.

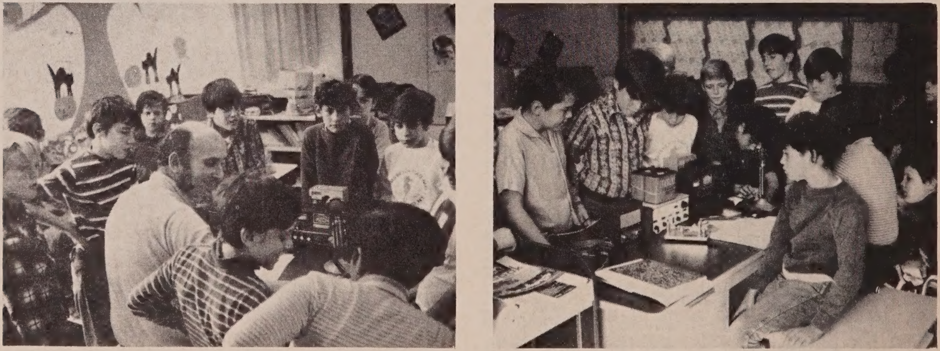
From This Side

In my listening and operating there's little on 80 and 40, 20 is delightful with great short skip propagation and lots of room and little QRM, 15 is sporadic, and, really, was 10

[*Continued on page 78*]

5th GRADERS ENROLL IN NOVICE CLASS AMATEUR RADIO COURSE

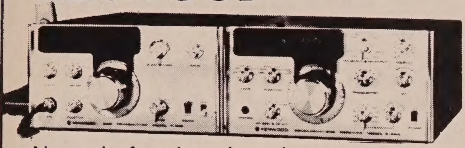
A formal amateur radio course for 5th grade students is in process in the Half Hollow Hills Creative Arts Workshop in Dix Hills, New York. The 17 session course is held every Saturday morning for two hours at the Chestnut Hill Elementary School, Central School District #5. Seventeen boys (average age—10 years) are spending their Saturday mornings learning elementary radio theory and Morse Code. A few of these kids, according to their instructor Norman Wesler, K2YEW, can already outcopy many of those die hard phone men who have been on the phone bands for years. Their instructor points out that 10 year old children can latch on to the code much faster than many an old timer who forever has business and family problems on his mind. Many of the leading amateur radio manufacturers and distributors such as Heath, Mosley, Swan, Ten-Tec, Harrison Radio Corporation, Ameco Publishing Corporation, Hy-Gain Electronics Corp., the Amateur Radio Callbook and *CQ* Magazine, have helped in sponsoring this happening in ham radio. Norm Wesler, who is volunteering his time for this event, expects to administer the Novice Class examination in March. Progress of this 5th grade experiment in amateur radio will be appearing in subsequent issues of *CQ* Magazine. ■



Norm Wesler, K2YEW, demonstrates the world of Amateur radio to a 5th grade class. Equipment donated by various manufacturers listed above is helping to produce the next generation of amateurs. This pilot program could work in your area too.

Henry Radio's

KENWOOD

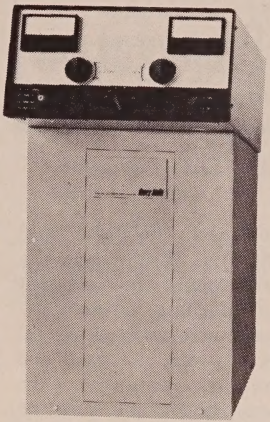


Never before has there been an amateur receiver and transmitter like the KENWOOD R-599 solid state receiver and T-599 hybrid transmitter. The wait is over . . . the promise of the transistor has been fulfilled. KENWOOD promises to be the new pacesetter in the field of short wave radio equipment . . . setting new standards of performance, reliability, flexibility, high styling, and value. Deliveries start in November. Order yours today. Become the proud owner of the world's most technologically advanced amateur Receiver/Exciter combination.

The R-599 Receiver	$298.00
The T-599 Transmitter	$345.00

Henry Radio's

2K-4

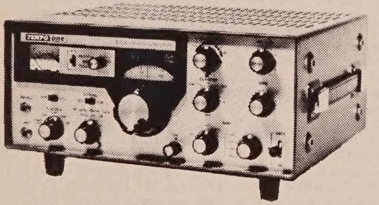


The 24-K linear amplifier embodies all of the famous features of the 2K-3 . . . rugged construction, reliable performance and heavy duty components, plus unique modern styling. The tilted RF deck faces up for easy visibility and convenient operation. If you are one of the more than 3000 happy 2K owners, trade up to the new 2K-4. If you are not one of the group, now is the time to join.

The 2K-4 (console or desk model) . . . $795.00

Henry Radio's

TEMPO "ONE"



The Tempo "ONE" SSB transceiver represents the culminating achievement of many years of experience in the amateur radio field. Modern design, superb performance, sturdy construction, outstanding reliability . . . at a surprisingly low price makes the Tempo "ONE" the best buy in transceivers today. Please come in or write for complete specifications.

The Tempo "ONE"	$298.00
AC/one, 110-220 volt 50/60 cycle power supply . . .	$99.00
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Now, meet Henry Radio . . .

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W6ZN
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Plus a large staff of highly qualified sales and service personnel pledged to serve you. Henry Radio carries large stocks of all major brands. We take trade-ins, sell used equipment and offer better terms because we carry our own financing. Our reconditioned equipment carries a 15 day trial, 90 day warranty and may be traded back within 90 days for full credit toward the purchase of new equipment. Export inquiries solicited. Also, military, commercial, industrial, and scientific users . . . please write for information on our custom line of high power linear amplifiers and RF power generators.

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"World's Largest Distributor of Amateur Radio Equipment"

Propagation

BY GEORGE JACOBS,* W3ASK

Beginning during early February and usually continuing through March and early April, a noticeable seasonal improvement should take place on opening between the northern and southern hemispheres, on all h.f. amateur bands between 10 and 160 meters. More frequent openings, with stronger signal levels, should be possible between the USA and South America, most of Africa, Australia, the Antarctic and parts of Asia during the month.

The 15 meter band should be the best band for world-wide DX propagation conditions during the daylight hours of February. Excellent openings are forecast to almost every area of the world, with generally strong signals and little fading or noise. The band is expected to open shortly after sunrise, and remain open to some areas of the world through the late afternoon and early evening hours.

Declining solar activity and seasonal changes in h.f. propagation patterns should result in somewhat fewer 10 meter DX openings on east-west paths during February. Some good openings, however, are predicted during the daylight hours on north-south paths, and on paths between the northern and southern hemispheres.

Excellent DX propagation conditions are forecast for 20 meters, with conditions peaking shortly after sunrise and again during the afternoon and early evening hours. To some areas of the world the band is expected to remain open during the hours of darkness as well.

Some fairly good DX propagation conditions are forecast for the 40 meter band from late afternoon, through the hours of darkness and continuing through the sunrise period. Exceptionally high signal levels are expected during some DX openings on this band during February.

LAST MINUTE FORECAST

February, 1971

Days	*Forecast Rating & Quality* (4)	(3)	(2)	(1)
Above Normal: 1-2, 15, 17-18, 26.			B-C	C
Normal: 3, 7-8, 10-11, 13-14, 16, 19-21, 25, 28.	A-B	B-C	C-D	D-E
Below Normal: 4, 6, 9, 12, 22, 24, 27.	C	D	D	E
Disturbed: 5, 23.	D	E	E	E

How To Use These Charts

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthese at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propogation Charts are based upon a transmitter power of 250 watts c.w.; 1 kw p.e.p. s.s.b., or 1000 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4 KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9, and 0 areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid from Feb. 15, 1970 through April 15, 1971 and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerece, Boulder, Colorado.

A seasonal increase in static level should result in somewhat poorer DX propagation conditions on 80 meters during February. Some fairly good openings, however, should be possible to many areas of the world during the hours of darkness and the sunrise period, especially on paths between the northern and southern hemispheres.

An occasional DX opening should be possible on 160 meters during the hours of darkness and the sunrise period, especially on nights when static levels are low.

---

*11307 Clara Street, Silver Spring, Md. 20902.

Sunspot Cycle

The Swiss Federal Solar Observatory reports a monthly mean sunspot number of 85 for October, 1970. This results in a running smoothed sunspot number of 106 centered on April, 1970. A smoothed sunspot number of 88 is forecast for February, 1971.

V.h.f. Ionospheric Openings

An occasional F-layer 6 meter opening may be possible between the southern half of the USA and points in the southern hemisphere during the noon and post noon hours of February. A seasonal increase in trans-equatorial (TE) propagation is expected during the month, with openings likely on 6 meter during the evening hours, between approximately 8 and 11 P.M., local time.

Auroral displays generally occur somewhat more frequently during February than during the earlier winter months. This should make possible an increased number of short-skip openings, ranging in distance from a few hundred up to approximately 1300 miles, on both 6 and 2 meters. Such openings result from the intense regions of ionization usually associated with auroral displays. While auroral ionization may improve propagation conditions on the v.h.f. bands, it often causes radio storms which disrupt propagation on the h.f. bands. Check the "Last Minute Forecast" appearing at the beginning of this column for those days that are likely to be disturbed or below normal during February. These are the days on which v.h.f. auroral-type openings are most likely to occur.

No significant meteor showers are expected during the month, and few, if any meteor-type ionosphere openings are likely to occur during February.

Sporadic-E ionization reaches a seasonal low during February, and few short-skip openings from this type of propagation are expected.

This month's *Propagation Charts* contain band opening predictions for major DX paths for the period February 15 through April 15, 1971. A short-skip propagation forecast for February apeared in last month's column. Insptructions for the proper use of the *Propagation Charts* appear directly below the "Last Minute Forecast" at the beginning of this column.

February 15—April 15, 1971

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-08 (1) 08-09 (3) 09-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	06-09 (3) 09-11 (2) 11-13 (3) 13-16 (4) 16-18 (3) 18-20 (2) 20-22 (1) 03-05 (1) 05-06 (2)	17-18 (1) 18-19 (2) 19-22 (2) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)*
Northern Europe & European USSR	08-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-14 (1)	05-07 (2) 07-09 (3) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-00 (1) 00-03 (2) 03-05 (1)	17-19 (1) 19-02 (2) 02-03 (1) 20-01 (1)*
Eastern Mediter-ranean & Middle East	08-09 (1) 09-11 (2) 11-12 (1)	08-09 (1) 09-10 (2) 10-11 (2) 11-13 (3) 13-16 (2) 16-18 (1)	05-07 (2) 07-12 (1) 12-15 (2) 15-16 (3) 16-17 (4) 17-19 (3) 19-22 (2) 22-00 (3) 00-02 (2) 02-05 (1)	18-20 (1) 20-23 (2) 23-00 (1) 20-23 (1)*
West & Central Africa	07-09 (1) 09-10 (2) 10-11 (3) 11-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-08 (1) 08-10 (2) 10-13 (3) 13-15 (4) 15-17 (3) 17-18 (2) 18-20 (1)	00-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-17 (3) 17-20 (4) 20-22 (3) 22-00 (2)	18-21 (1) 21-01 (2) 01-03 (1) 22-02 (1)*
South Africa	08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-10 (1) 10-12 (2) 12-15 (3) 15-16 (4) 16-17 (2) 17-18 (1)	05-07 (2) 07-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-23 (1) 23-02 (2) 02-05 (3)	18-20 (1) 20-23 (2) 23-00 (1) 21-23 (1)*
East Africa	09-12 (1) 12-15 (2) 15-17 (1)	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-17 (3) 17-18 (2) 18-19 (1)	12-14 (1) 14-17 (2) 17-22 (3) 22-01 (2) 01-05 (1)	19-23 (1) 23-01 (2) 01-02 (1)
Central & South Asia	08-11 (1) 19-21 (1)	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-19 (1) 19-21 (2) 21-23 (1)	19-22 (1) 04-06 (1)
Southeast Asia	10-13 (1) 18-20 (1)	08-10 (1) 14-17 (1) 17-19 (2) 19-21 (1)	05-07 (1) 07-09 (2) 09-11 (1) 14-17 (1) 19-20 (1) 20-23 (2) 23-01 (1)	05-07 (1)
Far East	09-11 (1) 17-19 (1)	07-10 (1) 16-17 (1) 17-19 (2) 19-21 (1)	05-07 (1) 07-09 (3) 09-11 (2) 11-13 (1) 18-20 (1) 20-22 (2) 23-00 (1)	05-08 (1)

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

South Pacific & New Zealand	09-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	08-10 (1) 12-13 (1) 13-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	10-12 (2) 12-19 (1) 19-22 (2) 22-01 (3) 01-05 (2) 05-07 (1) 07-10 (3)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-07 (1)*
Australasia	09-11 (1) 15-16 (1) 16-19 (2) 19-20 (1)	08-09 (1) 09-11 (2) 11-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-15 (1) 15-17 (2) 17-21 (1) 21-23 (2) 23-01 (1)	02-04 (1) 04-06 (2) 06-08 (1) 04-06 (1)*
Northern & Central South America	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (4) 14-16 (3) 16-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-10 (4) 10-12 (3) 12-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	00-02 (2) 02-05 (1) 05-06 (2) 06-07 (3) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-22 (4) 22-00 (3)	18-19 (1) 19-20 (2) 20-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-22 (1)	15-16 (1) 16-17 (2) 17-18 (3) 18-22 (4) 22-02 (3) 02-04 (2) 04-06 (1) 06-07 (2) 07-09 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	16-18 (1)	12-17 (1) 17-19 (2) 19-20 (1)	15-17 (1) 17-21 (2) 21-00 (3) 00-02 (2) 02-05 (1) 05-07 (2) 07-09 (1)	22-00 (1) 00-04 (2) 04-06 (1)

Time Zones: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-12 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-14 (2) 14-15 (1)	00-06 (1) 06-09 (2) 09-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-22 (1) 22-00 (2)	17-19 (1) 19-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Northern Europe & Eastern USSR	09-11 (1)	07-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-20 (1)	19-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Eastern Mediterranean & Middle East	09-11 (1)	07-09 (1) 09-11 (2) 11-13 (1)	07-09 (1) 09-12 (2) 12-15 (3) 15-17 (2) 17-22 (1) 22-00 (2) 00-02 (1)	19-22 (1) 20-22 (1)*
West & Central Africa	09-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-15 (4) 15-16 (3) 16-18 (2) 18-19 (1)	04-06 (2) 06-12 (1) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-00 (2) 00-04 (1)	18-20 (1) 20-23 (2) 23-01 (1) 21-00 (1)*
East Africa	10-12 (1) 12-14 (2) 14-15 (1)	08-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	12-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-00 (1)	19-22 (1)
South Africa	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (1)	07-09 (1) 09-11 (2) 11-12 (3) 12-13 (4) 13-14 (3) 14-16 (2) 16-17 (1)	05-07 (2) 07-13 (1) 13-15 (2) 15-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-05 (1)	19-22 (1) 20-21 (1)*
Central & South Asia	07-09 (1) 17-19 (1)	08-10 (1) 18-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-21 (2) 21-00 (1)	05-07 (1) 18-20 (1)
Southeast Asia	09-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	09-10 (1) 10-12 (2) 12-17 (1) 17-19 (2) 19-21 (1)	06-07 (1) 07-10 (2) 10-12 (1) 16-18 (1) 18-21 (2) 21-23 (1)	04-07 (1)
Far East	15-17 (1) 17-19 (2) 19-20 (1)	09-11 (1) 14-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	06-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 18-20 (1) 20-00 (2) 00-06 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific & New Zealand	10-12 (1) 12-14 (2) 14-18 (3) 18-19 (2) 19-20 (1)	09-12 (1) 12-14 (2) 14-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	07-09 (3) 09-11 (2) 11-18 (1) 18-21 (2) 21-23 (3) 23-01 (4) 01-03 (3) 03-07 (2)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-05 (2)* 05-07 (1)*
Australasia	09-11 (1) 14-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	07-09 (1) 09-11 (2) 11-14 (1) 14-16 (2) 16-18 (1) 18-19 (2) 19-20 (3) 20-21 (2) 21-23 (1)	04-07 (2) 07-09 (3) 09-12 (2) 12-14 (1) 14-16 (2) 16-20 (1) 20-22 (2) 22-00 (4) 00-04 (3)	02-04 (1) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Northern & Central South America	08-09 (1) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-10 (4) 10-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19 20 (1)	06-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-05 (1) 05-06 (2)	18-19 (1) 19-20 (2) 20-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	13-15 (1) 15-16 (2) 16-17 (3) 17-22 (4) 22-02 (3) 02-04 (2) 04-06 (1) 06-07 (2) 07-09 (1)	19-20 (1) 20-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	15-18 (1)	13-16 (1) 16-19 (2) 19-20 (1)	16-19 (1) 19-20 (2) 20-00 (3) 00-04 (2) 04-05 (1) 05-07 (2) 07-09 (1)	22-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1) 19-21 (1)	00-06 (1) 06-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-17 (2) 17-22 (1) 22-00 (2)	19-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*

[*Continued on page 80*]

THE awards PROGRAM

BY ED HOPPER,* W2GT

USA-CA HONOR ROLL

Award	Call	No.
3000	WA4YQC	56
	K8YGU/WA7PAB	57
	K5KDG	58
	WA8NDL	59
2500	WA4YQC	93
	K8YGU/WA7PAB	94
2000	WA4YQC	120
1500	WA4YQC	150
1000	WA4YQC	219
	K8NQP	220
500	WA4YQC	817
	W0MHK	818
	W6KYA	819
	K5GKN	820

THE January, "Story of The Month", about Abe Daniels, WA7EGL, after this important awards-issued data.

As you can see by the Special Honor Roll, a large number were able to qualify for All Counties. Actually 7 in the month of October, that includes George, WA4FGX, 10-5-70.

Cecil Pryor, WA4YQC surprised me by suddenly applying for all 500 through 3079.

Nice to hear from John Kepus, K8YGU/WA7PAB who qualified for 2500, 3000 and All 3079.

Steve Cope, K5KDG also found time to complete the necessary paper work to gain 3000, and All 3079.

John Ochmann, WA8NDL sent in his application for USA-CA-3000 endorsed All 14 mc A3A and All 3079 CA endorsed All A3A.

Joseph Vaughan, K8NQP was issued USA-CA-1000 endorsed All A-1.

Mixed 500 awards were sent to Don Whitney, K5GKN and John Minke III, W6-KYA. A 500 award endorsed All A-1 went to Bill Grim, Jr., W0MHK.

Special Honor Roll
All 3079 Counties!

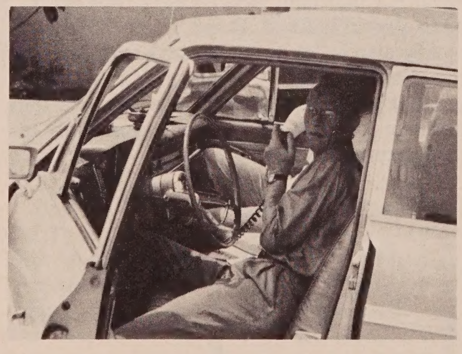
#41—Cecil R. Pryor, WA4YQC, 10-6-70.
#42—Cleo J. Mahoney, WA0SHE, 10-12-70.
#43—Leo C. Haijsman, W4KA, 10-13-70.
#44—John Kepus, K8YGU/WA7PAB, 10-15-70.
#45—Doyle "Steve" Cope, K5KDG, 10-26-70.
#46—William S. Todd, K4ISE, 10-28-70.
#47—John C. Ochmann, WA8NDL, 11-3-70.

T. A. "Abe" Daniels, WA7EGL

Abe was born in 1923 in the small town of Blanket, Texas, where he lived until he was 16. Then the family moved to San Diego, California where on December 31, 1939 he joined the U.S. Navy.

Fourteen years were spent in the Navy roaming the entire Pacific Ocean and visiting most every Island and Country in that vast expanse of water, including such places as Australia, New Zealand, New Guinea, Borneo, China, The Philippines and Japan.

After leaving the Navy, some 9 years were spent working for the Southern Pacific Railway as a teletype mechanician, traveling about the state of California.



WA7EGL—Abe & Mona JoAnne ready for another trip.

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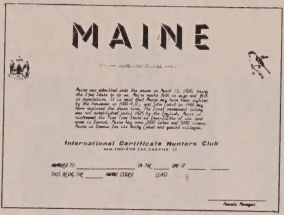
*103 Whittman St., Rochelle Park, N.J. 07662.



MAINE

International Certificate Hunters Club

AWARDED TO ______ ON THE ___ DAY OF ___ ___

THIS BEING THE ___ AWARD ISSUED CLASS

Maine Sesquicentennial Award

In 1962, Abe met lovely Mona JoAnne, they were married shortly thereafter and moved to Albuquerque, New Mexico.

In New Mexico an interest in amateur radio was developed and WA5KZV was activated.

Three years later a move was made to Boise, Idaho, where Abe became a Heavy Duty line truck driver.

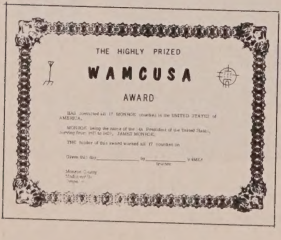
Shortly after moving to Idaho, he became aware of the County Hunter Net and has operated on the Net most of his spare time since then and we all know him as WA7EGL.

After working with Idaho State Officials for nearly two years, Abe was happy to be able to have his many hours of work and conferences at the State House begin to pay off. Idaho hams now have their own official State QSL card and certificate. This is the first big step in the State's recognition and promotion of its growing amateur radio group.

As mentioned on page 71 of May 1970 *CQ*, these beautiful QSL cards are furnished free to Idaho hams through the courtesy of The Idaho State Commerce and Development Department, Capitol Building, Boise, Idaho.

All data on The Idaho Counties Award was on page 75 of September 1970 *CQ*. Cost is $1.00 (or 10 IRCs for DX stations) for QSOs on or after January 1, 1969. For additional data send s.a.s.e. to Gem State A.R.C. Awards Chairman, Abe Daniels, WA7EGL, 4310 Franklin Road, Boise, Idaho 83705.

Abe also insists that the Guys and Gals on the County Hunters Net are one of the greatest group of people he has ever had the pleasure to know, and he is always happy to meet more of them in person.



THE HIGHLY PRIZED

WAMCUSA

AWARD

Worked All Monroe Counties

His door is always open to any and all who drift into the northwest and he has had the pleasure of visits from W5HDK, WA7IRD, K7WQJ, K7ZJP, K8YGU and W0IXM.

Abe and Mona JoAnne greatly enjoy making trips to give counties to those on the Net who need them from Idaho and the surrounding states. Every effort is made to try for at least two or three long trips each year to give out those needed counties.

Awards

Maine Sesquicentennial Award: Work Maine stations during Sesquicentennial year 1970 for points. Basic Class 10 points, classes for each additional 10 points. For W/VE stations: Maine stations count 2 points (Maine CHCers count 3 points). For DX stations (including KH, KL, Novices and v.h.f. 50 mc up): Maine stations count 4 points (Maine CHCers count 5 points). Basic Class $1.00 or 10 IRCs, additional class endorsements s.a.s.e. or regular fee if a separate certificate is desired. Send GCR list and fee to N. E. Chapter CHC #32, George Levensalor, W1DPJ, 399 Buck St., Bangor, Maine 04401.

Worked All Monroe Counties Award: This WAMCUSA Award will be issued free to any amateur for working All 17 U.S. Monroe Counties. Send log data (NOT QSLs) and a s.a.s.e. to: Max Holland, W4MEA, Hiwassee College, Madisonville, Tenn. 37354. (Yes, that is Monroe County).

Notes

Sorry that I am so far behind in listing Awards. The reason is space limitations.

An *ICHN* mini-convention was held on 17 and 18 October at the Holiday Inn in West Memphis, Arkansas and a good time was had by all. Among those attending were: W4GGU, W4HA, WA4LSU, W4YWX, K5DRF, K5HDK, K5LSI, K5RPC, W5ULN, K5USO, K8DCR, W9CNG, WA9FZR, W9SOM, W0SJE, WA0SKQ, WA0WOB, and W0YLN.

A few months ago I received a letter from a mid-west station in a county inhabited by only 4 active amateurs. All 4 deny working *any* of the stations listed each month as having obtained a USA-CA. None of the 4 use s.s.b. or c.w., always f.m. on 146.94. He doubted that the County Awards Program was a legitimate thing. I was glad that as long as he had such doubts, that he did write. I was

[*Continued on page 78*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

My recent column on military handy-talkies stimulated quite a bit of interest and mail, and this month I want to cover briefly several of the other sets of that type that have become available in surplus over the last few years, giving their frequency ranges and basic characteristics (fig. 1). One reader, Alan Trasker, sent me a copy of the AN/URC-11 schematic, and I want to show it this month, (fig. 2), as it is for the earlier, all-tube version, whereas the URC-11 diagram printed in *CQ*, May, 1969, showed the -A hybrid set. Fig. 3 is the hookup diagram for the AN/PRC-34 and 36 sets which are the famous "helmet radios".

Things have progressed quite a ways from the BC-222, the Army's first portable set which used those ancient type 30 and 33 triodes. Fig. 4 is a photo of the AN/PRC-90, one of the 1971 generation of military handi-talkies. This unit, already seen in salvage, cost the Pentagon $500. It's a bargain as such things go. Weighing 24 ounces, it's worth more than half its weight in solid gold.

The PRC-90, a u.h.f. set, and a sister line of h.f. transceivers, designed by Sylvania, are of course solid-state devices, with battery power enough to provide from 12 to 15 hours operation, far better than the older tube sets which often had a power drain of 750 ma in transmit mode.

The PRC-90 will transceive on the 243 mc emergency band, or on 282.8 mc. It has a beacon tone transmitter and a Morse key, whip antenna, ear plug 'phone, and integral 'phone/mic as the photo shows. Power is rated at 500 milliwatts, p.e.p., with a stated range of 85 miles. The set incorporates dual transmitters and receivers for its two channels, using microelectronics to pack all that circuitry into a case six inches long and 3 inches wide by an inch and a quarter thick.

The h.f. set, not yet given military nomenclature, is slightly heavier, but almost identical in size. It is f.m., with 1 watt output, and contains a three channel transceiver in the 34-50 mc band.

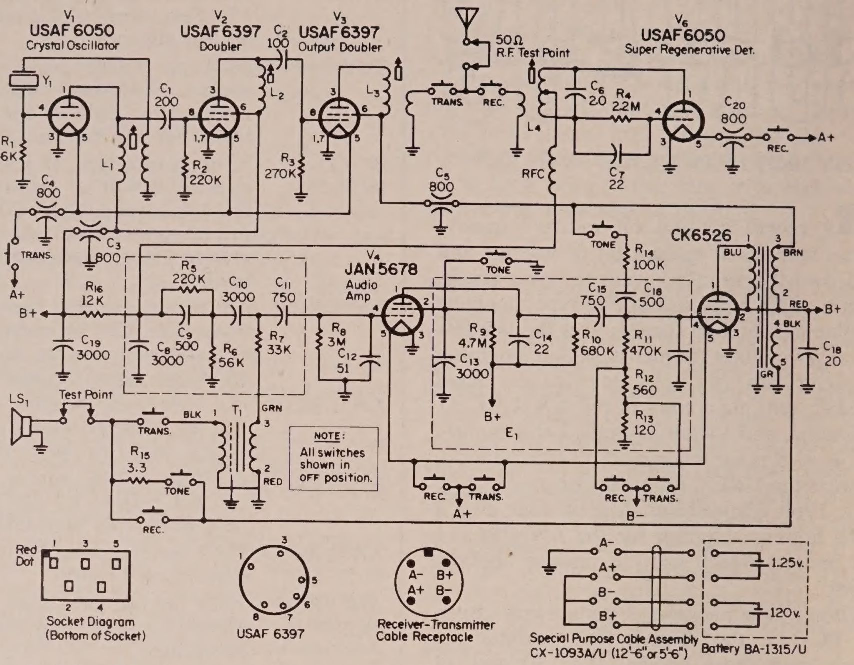
BC-22	H.f., uses 2 triodes, type 30 and 33. (First Army walkie-talkie; ancient history.)
TBY	28-40 mc, 7-tube. Navy, also ancient. Modulated oscillator makes it too unstable for use today. See *CQ*, 9-57, p. 64.
BC-611 (SCR-585)	3.5-6 mc tube type. This is the standard WW II set, used in all the war movies. Used 455 kc i.f. 1.5 volts at 350 ma, 103 volts at 350 ma (transmit) 160 ma (rec).
AN/CRC-7	140.58 mc, the first "rescue" transceiver. Can be converted to 2 meters if you are patient and do not expect too much.
AN/URC-4	121.5-243.0 mc—another rescue set. Converts easily to 2 meters. See *CQ*, Nov. 1970.
AN/URC-11	243.0 mc, a later smaller rescue set. Goes to 220 mc readily. See *CQ*, May 1969.
AN/URC-14	121.5 mc version of URC-11. Converts to 2 meters.
AN/PRC-6 (SCR-536)	20-28 mc f.m. (a.m.) set. low power, maybe a 6-meter conversion.
AN/PRC 8	Similar to PRC-6.
AN/PRC-9	backpack 27-39 mc f.m. set.
AN/PRC-10	38-55 mc version of PRC-9.
AN/PRC-34	38-51 mc f.m. helmet radio, transistors and tube.
AN/PRC-36	48-51 mc belt-carried f.m. version of PRC-34.
AN/PRC-41	225-400 mc u.h.f. set, 1750 channels, 3 watts a.m.
AN/PRC-90	243-282 mc u.h.f. set, twin microelectronic transceivers in cigarette-package size.
MAY	225-400 mc packset, older type, 1 watt a.m. (NavShips 91792)
SCR-300 (BC-1000)	40-48 mc f.m., older WW II type.

Fig. 1—Characteristics of the more common military walkie-talkie sets.

Much more common are the AN/PRC-34 and 36 sets, the helmet radios of the 1960's. Both used the same transceiver, with different packaging. The -34 had a single crystal controlled channel in the 38-51 mc band, and was worn inside a special helmet, with the 12-inch antenna mounted atop the helmet. The PRC-36 also used a helmet antenna, but the

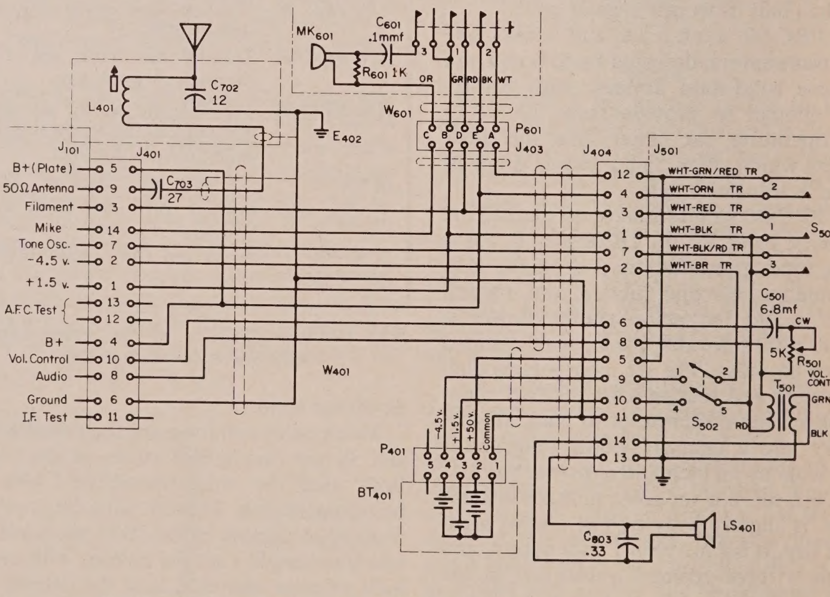
---

*5716 N. King's Hgwy., Alexandria, Vir. 22303.



V1
USAF 6050
Crystal Oscillator
V2
USAF 6397
Doubler
C2
100
V3
USAF 6397
Output Doubler
50Ω
R.F. Test Point
V6
USAF 6050
Super Regenerative Det.
Y1
R1
56K
C1
200
L1
R2
220K
L2
R3
270K
L3
TRANS.
REC.
L4
C6
2.0
R4
2.2M
C20
800
REC.
A+
C4
800
C5
800
RFC
C7
22
TRANS.
C3
800
A+
TONE
R14
100K
CK6526
BLU
BRN
TONE
V4
JAN 5678
Audio Amp
R5
220K
C10
3000
C11
750
R16
12K
B+
C15
750
C18
500
RED
B+
C9
500
R7
33K
R8
3M
R9
4.7M
C14
22
R10
680K
R11
470K
4 BLK
C18
20
C19
3000
C8
3000
R6
56K
C12
51
C13
3000
R12
560
GR
LS1
Test Point
GRN
B+
BLK
T1
R13
120
E1
TRANS.
R15
3.3
NOTE:
All switches shown in OFF position.
RED
TONE
REC.
TRANS.
A+
REC.
TRANS.
B−
REC.
Red Dot
Socket Diagram
(Bottom of Socket)
USAF 6397
A− B+
A+ B−
Receiver-Transmitter Cable Receptacle
A−
A+
B−
B+
1.25v.
120v.
Special Purpose Cable Assembly
CX-1093A/U (12'-6" or 5'-6")
Battery BA-1315/U

Fig. 2—Schematic diagram, AN/URC-11 243 mc transceiver. This is the initial model, which used six subminiature tubes, where the later sets URC-11-A, use transistors in the audio section. The 5678 tube may be replaced by a 2E32 and a 6397 by a 6147. The 6050 tube is similar to the 5676. The set used a BA-1315U battery, supplying 1¼ volts and 120 volts, d.c.



MK601
C601
.1mmf
R601 1K
OR
GR
RD
BK
WT
L401
C702
12
W601
E402
P601
J403
J101
J401
J404
J501
B+(Plate)
50Ω Antenna
Filament
Mike
Tone Osc.
−4.5 v.
+1.5 v.
A.F.C. Test
B+
Vol. Control
Audio
Ground
I.F. Test
C703
27
WHT-GRN/RED TR
WHT-ORN TR
WHT-RED TR
WHT-BLK TR
WHT-BLK/RD TR
WHT-BR TR
S501
C501
6.8mf
CW
5K
R501
VOL. CONT.
W401
T501
GRN
BLK
S502
RD
−4.5v.
+1.5v.
+50v.
Common
P401
BT401
C803
.33
LS401

Fig. 3—Hookup diagram for the AN/PRC-34 and -36 helmet radios.

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set itself was worn on the belt or back pack. PRC-36 sets had a more restricted 47.8-51 mc coverage, but this is only through choice of available crystals.

Both were of course f.m., with 75 milliwatts of output and an 8 to 10 hour rated battery life.

Range of these sets was estimated at 250 yards with the antenna tied down to the wearers helmet, and 500 yards with the antenna unrestrained. The transmitter uses a CK-6051 tube in an electron-coupled Colpitts oscillator circuit, with the frequency controlled by the receiver r.f. mixer stage, which is the difference in frequency between the transmitter frequency and the receiver oscillator frequency. An automatic frequency control voltage is developed and fed back to the oscillator tube to keep the set on frequency. The rest of the set is solid state, though using discrete elements. Sensitivity is rated at 3 microvolts in receive mode.

Batteries used are BA-26, for 45 volt B plus, and BA-23 for 1.5 volts for the transmiter filament and 4.5 volts bias.

Frankly, the PRC-36 is pretty small stuff to do much work on. They were designed to have modules replaced, not repaired, but at least they can be repaired. The more recent stuff is so micro-miniaturized that repair would require a microscope. There are people who do that work, but few of us would qualify. ■

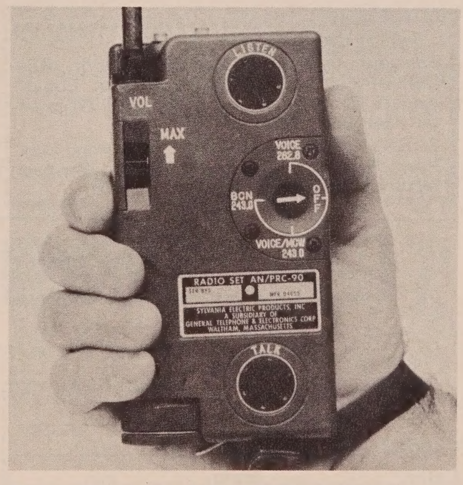

Fig. 4—This is the AN/PRC-90 u.h.f. dual transceiver. The same design is available in a high-frequency version. At 24 ounces, the PRC-90 costs the Army more than $20 an ounce.

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R-390/URR Rcvr: Collins xtl-zero-beating, driftless receiver, grtd 100% perfect, with bk. **795.00**

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USA-CA [*from page 74*]

pleased to acquaint him with the facts that most of my readers already know. Actually there are many U.S. counties with *no* active hams. Fortunately such countries become active through field day operations, state and call-area QSO Parties. But naturally the biggest help is from the *hundreds* of mobileers who roam the entire U.S. I will not try to mention any specific stations (mobiles) as space would not permit listing even a portion of them, but many mobiles have given out 300, 400, 500 and even more counties and continue to do so on their daily, weekly, monthly trips or vacation trips. *Many* County Hunters have worked mobile stations in 2500 counties. I was even able to give this unbeliever the calls of several mobiles that I had worked on several occasions in *his* county. So anytime you have any doubts or questions, please write for the facts.

Although I did not get any data (in time) regarding the 1970 CW County Hunters Contest, I will be happy to mention that the 1971 Contest is scheduled for the July 24/25 weekend. Full details by sending a s.a.s.e. to Jim Hoffman, K1ZFQ, 42 Gresham St., Milford, Conn. 06460. He wall be happy to also tell you about his CW CH Newsletter. How was your month? 73, Ed., W2GT.

WCARS [*from page 68*]

meters ever open? I've heard lotsa good net controls on my favorite Services but Paddy, 4S7PB, who usually calls Southeast Asia Net (14.320, 1200 GMT) is one of the best I've heard. I'm always there when able and otherwise on the high end of 20. When I hear some action on 15 I'll be on the end from 21.350 up. When I put that new prefix, YB8, on the air it will be WCAR members first, then MIDCARS and EASTCARS. Then I'll start on the rest of you DX hounds.

73, Ed, WB6IZF/9V1QF/YB8??

F.M. [*from page 32*]

secret is to order the crystal for injection on the proper side of the carrier frequency while remaining within the normal tuning range of the oscillator-multiplier chain. For example, high band (2M) equipment normally use low-side injection (oscillator frequency lower than carrier). Assuming a signal of 152 mc and a 1st i.f. of 12 mc places the oscillator-multiplier chain at 140 mc. At 172 mc the oscil-

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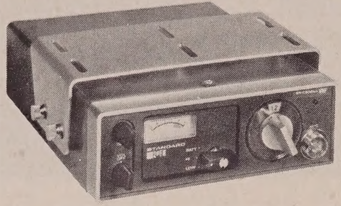

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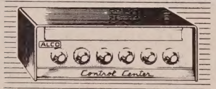

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lator-multiplier chain would be at 160 mc. If the crystal for 2 meters was ordered for 146 mc the oscillator chain would be operating range of the oscillator chain. However, if the crystal were ordered for high side injection the oscillator chain would be operating at 158 mc which is within the normal range of the oscillator-multiplier chain. International Crystal, as well as others, will correlate for either high side or low side injection when specified. As a rule of thumb the injection frequencies are usually as follows:

10 Meters	High Side
6 Meters	Low Side
2 Meters	High Side

Finale

This just about overruns the alloted space. However, there is still enough space left to ask for more news and similar items about amateur f.m. This column is for the f.m.'er and must be supported by the f.m.'er to accomplish the job of keeping amateur f.m.'ers informed. ■

Propagation [*from page 72*]

Central & Northern Europe & European USSR	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-21 (1)	05-06 (1) 06-09 (2) 09-12 (1) 12-15 (2) 15-17 (1) 22-00 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	07-08 (1) 08-10 (2) 10-11 (1) 20-22 (1)	07-12 (1) 12-14 (2) 15-18 (1) 18-22 (2) 22-02 (1)	18-21 (1)
West & Central Africa	09-11 (1) 11-14 (2) 14-16 (1)	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-22 (1)
East Africa	10-12 (1) 12-14 (2) 14-15 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-17 (1)	06-08 (1) 12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	18-20 (1)
South Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-08 (2) 08-13 (1) 13-15 (2) 15-18 (3) 18-19 (2) 19-21 (1) 21-23 (2) 23-06 (1)	18-21 (1)
Central & South Asia	07-09 (1) 18-20 (1)	07-09 (1) 16-17 (1) 17-19 (2) 19-20 (1)	16-18 (1) 18-21 (2) 21-23 (1) 02-03 (1) 03-05 (2) 05 07 (1) 07-09 (2) 09-12 (1)	05-07 (1) 19-21 (1)
Southeast Asia	08-09 (1) 09-11 (2) 11-12 (1) 14-16 (1) 16-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-17 (1) 17-20 (2) 20-00 (1)	06-09 (3) 09-11 (2) 11-15 (1) 18-00 (1) 00-06 (2)	00-02 (1) 02-05 (2) 05-07 (1)

Far East	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	08-10 (2) 13-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (2) 07-09 (3) 09-11 (2) 11-19 (1) 19-21 (2) 21-23 (3) 23-04 (2) 04-06 (1)	00-02 (1) 02-07 (2) 07-08 (1) 02-06 (1)*
South Pacific & New Zealand	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-10 (1) 10-16 (2) 16-18 (3) 18-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	04-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-20 (3) 20-00 (4) 00-02 (3) 02-04 (2)	19-21 (1) 21-22 (2) 22-23 (3) 23-25 (4) 05-06 (3) 06-07 (2) 07-08 (1) 22-01 (1)* 01-05 (2)* 05-06 (1)*
Austral-asia	11-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (1)	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (1) 17-18 (2) 18-20 (4) 20-21 (2) 21-22 (1)	12-20 (1) 20-21 (2) 21-22 (3) 22-01 (4) 01-03 (3) 03-04 (2) 04-06 (1) 06-07 (2) 07-09 (3) 09-12 (2)	00-01 (1) 01-02 (2) 02-05 (3) 05-06 (2) 06-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Northern & Central South America	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	05-06 (2) 06-09 (3) 09-14 (2) 14-16 (3) 16-20 (4) 20-22 (3) 22-00 (2) 00-05 (1)	18-20 (1) 20-01 (3) 01-03 (2) 03-06 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-11 (2) 11-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-22 (4) 22-00 (3) 00-04 (2) 04-08 (1)	16-20 (1) 20-01 (2) 01-03 (1) 22-02 (1)*
McMurdo Sound, Antarctica	14-17 (1)	14-16 (1) 16-19 (2) 19-20 (1)	16-18 (1) 18-19 (2) 19-00 (3) 00-04 (2) 04-05 (1) 05-07 (2) 07-09 (1)	22-02 (1) 02-04 (2) 04-06 (1)

F.M. Deviation *[from page 35]*

through an isolation resistor of approximate 0.5 to 1 meg in order to prevent loading of the i.f.

Adjust the feedback control for a non-oscillating condition. Then fire up the transmitter or a signal generator you want to calibrate. Bring the frequencies of transmitter and receiver to exact values so the carrier may be observed on the oscilloscope. Tune the *Q*-Multiplier to the i.f. and adjust the feedback control just short of oscillation. The display on the screen might now jump up and down a little. In this case try some more input to the receiver. This jumping is caused by initial f.m. of either the receiver or transmitter. Stability at this point is very important. Connect to the output of the vertical scope amplifier the a.c. voltmeter of the v.t.v.m.-type, capable of handling the i.f. of the receiver, if available. The reason for the v.t.v.m. is a better definition of the nulls in conjunction with the oscilloscope.

Increase the level of the audio oscillator slowly and one will see the carrier drop to a very low level on both the oscilloscope and the v.t.v.m. This is the first null and using a frequency of 600 c.p.s. as the modulating frequency, it means that the carrier is now swinging plus-minus 1.443 kc from its center frequency. Advancing the level further will bring another null at 3.312 kc. The levels for these nulls should be recorded. One can see that the frequencies of 600 c.p.s. and 1000 c.p.w. are the most useful. Most equipment sold at present is made to operate with 60 kc channel spacing. Transmitters and receivers from this category are mostly adjusted for 15 kc f.m. In this case a 1000 c.p.s. frequency should be used. The oscilloscope will display at the nulls a residual signal due to the fact that the side bands are not completely attenuated. ■

Our Readers Say *[from page 10]*

accompanied by a decrease in grid current, the circuit is properly neutralized. According to the abovementioned text, if there is a grid current peak on the low capacitance side of plate circuit resonance, *C*n is too small, while of there is a grid current peak on the high capacitance side of plate circuit resonance, *C*n is too large.

W9EG's article, "In Defense of C.W. "brought out many interesting points. However, there are other pulses for c.w. which often do not get mentioned. C.w. is perhaps the most non-disruptive mode of communication there is. One can operate c.w. almost anywhere and any time without disturbing the household. As I understand it, some phone operators have to mumble into the microphone at late hours of the night so as not to disturb anyone trying to sleep! Also, some XYL's don't like being left alone while the OM goes off to the ham rig. With c.w. it is possible to keep the family together in presence while the OM hams and the XYL watches TV! Another plus for c.w. is that operation is not affected by bouts of laryngitis. In a sense, c.w. is not outmoded in terms of technology—putting together a good c.w. outfit is as much an intellectual challenge as is s.s.b. or v.h.f. A *good* c.w. rig requires a bit of work to accomplish, and it is quite likely only those who have been in pursuit of high quality c.w. can appreciate the challenge. Undoubtedly there will always be those who will criticize the code requirements for licensing, Perhaps one way to solve the problem would be to keep the present structure, but to introduce a regulation wherein higher class licenses have lower maximum power limits, i.e., get an extra-class license, more spectral space, but be limited to a maximum of 100 watts input. Perhaps then there would be less desire for "greater" privileges!

John J. Duda, W2ELV
Genesco, N.Y.

Standard Review [*from page 42*]

5/8 wave mobile ant.	SR-CAT05H	27.95
Telephone hand set	SR-CMP02H	49.95
25 w. base station a.c. power supply	SR-C12/120-5H	89.95
Remote Speaker	SR-C202KH	18.95
25 w. alternator whine filter	SR-CFL06AH	7.40
Portable antenna	SR-CAT06H	4.50

The basic Standard SR-C806MA comes equipped with crystals for operating on four channel pairs, mounting bracket, microphone, 2 amp alternator whine filter, and connecting hardware. Price of the basic unit is $335.00. The manufacturer is Standard Communications Corp., 639, N. Marine Ave., Wilmington, Calif. 90744.

—K9STH

DX [*from page 59*]

JW, Svalbard: JW5NM—21025 kc and 28010 kc.
JX, Jan Mayen: JX2HK—28071 kc. JX8YM—28022 kc.
LX, Luxemburg: LX1CF—28020 kc.
OD5, Lebanon: OD5LX—28025 and 14036 kc.
SU, Egypt: SU1IM—14029 kc.
TA, Turkey: TA1RO, 14016 kc.
TJ1, Cameroun: TJ1AW—14015 kc.
UF6, Georgia: UF6VA—7026 kc.
UH8, Turkoman: UH8BO—28017 kc, UH8BX—7005 kc, and UH8CJ—28034 kc.
UI8, Uzbek: UI8IF—14038 kc, UI8IZ—14010 kc and UI8SK—28020 kc.
UJ8, Tadzhik: UJ8AB, 21048 kc.
UL7, Kazakh: UL7AYQ—3502 kc, UL7LH—7029 kc, LU7FAB—7020 kc, UL7XI—7005 kc, UL7CA—14048 kc, UL7XE—14024 kc, and UL7GW—28050 kc.
UM8, Kirghiz: UM8FM—14050 kc.
VP1, British Honduras: VP1WA—21014 kc.
VP8, Falkland Islands: VP8LR—28030 kc.
VS6, Hong Kong: VS6FE—21026 kc.
ZC, Cyprus: ZC4CB—21015 kc and ZC4IK—21016 and 28010 kc.
3B7, St. Brandon: 3B7DA—14065 kc.
4S7, Ceylon: 4S7DA—74053 kc.
5R8, Malagasy: 5R8AP—7004 kc.
5U7, Niger: 5U7AW—14034 kc.
8P6, Barbados: 8P6AE—21032 kc.
9H1, Malta: 9H1BB—14010 kc, 9H1CB—28026 kc, and 9H1R—21029 kc.

S.S.B. Log

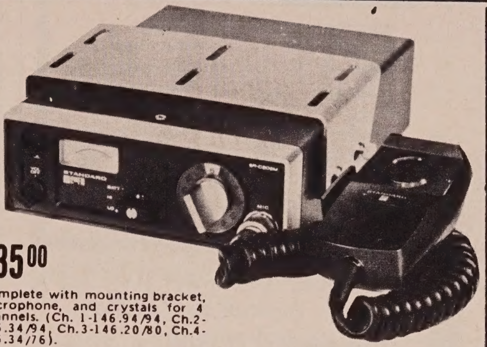
AX9, Cocos-Keeling: AX9YR—14250 kc.
EA9, Spanish Morocco: EA9EJ—14260 kc.
FH8, Comoro Islands: FH8CG—28506 kc.
FR7, Reunion Island: FR7AG—21222 kc.
GD, Isle of Man: G3YBH will operate GD3YRB during Feb. and March DX tests. QSL via RSGB.
HK , San Andres Island: HK0BKW—21330 kc.
HS1, Thailand: HS1ACW—14205 kc.
HV3, Vatican City: HV3SJ—14259 kc.
JY, Jordan: JY1—28591 kc, JY1B—14332 kc.
MP4B, Bahrein: MP4BHL—28604 kc, MP4BBA 28566 kc and 14264 kc.
ST2, Sudan: ST2SA, 14220 kc.
TA3, Turkey: TA3HC—28548 kc.
TR8, Gabon: TR8VW—28594 kc.
UJ8, Tadzhik: UJ8AJ—14204 kc.
VP8, Falkland Islands: VP8KL—28555 kc.
VP8, South Orkneys: VP8JV—14195 and 14240 kc. QSL to Box 137, Port Stanley, Falkland Islands.
VS6, Hong Kong: VS6DO—14201 and 3806 kc.
YA1, Afghanistan: YA1HD—28497 kc.
ZC4, Cyprus: ZC4DB—28487 kc. and ZC4RAF—28500 kc.
ZD3, Gambia: ZD3D—14225 and 21410 kc.
ZD7, St. Helena: ZD7SD—14259 kc.
ZS2, Marion Island: ZS2MI—21276 kc.
6W8, Senegal: 6W8DY—2801 kc.
7Z3, Saudi Arabia: 7Z3AB—14244 kc.
9K2, Kuwait: 9K2AJ—14214 kc.
9M2, West Malaysia: 9M2CP—14215 kc.
9N1, Nepal: 9N1MM—14212 kc.

Rare Prefixes on the Air

DA1, DA2, & DA4—These are the new German prefixes currently being issued to foreign military personnel stationed in Germany.
LJ2—LF2F on 14040 kc.
OH8—OH8SO on 14041 kc.
OY3—This rare Faeroe's Island prefix is activated by OY3MH on 28 mc c.w.
RA0—RA0LEX on 28034 and RAEM on 14010 kc.
RI8—RI8IAC works 28 mc c.w. around 28060 kc.
RJ8—Try RJ8JBR on 28545 or 28559.
TF0—Starting Oct. 1, 1970 all foreign nationals in iceland are required to sign their home calls portable TF. This counts as TF0 for WPX.
TG4—TG4SR operates 15 meter c.w.
UK7—UK7LAA near 14040 kc is a club station in Kazahk.
UK8—UK8GAA near 14001 is a club station in UI8-land.
WX5—WX5RRX was a special call for use aboard the historic British train "Flying Scotsman" during its June-August, 1970 run from Slaton, Texas to Green Bay, Wisconsin.
YA0—YA0CDRC, the Camel Drivers Radio Club station, frequents 14340 and 21375.
4W0—LA8YB/4W is to bet in Yemen for 1 year. QSL to LA3BI.
5L1—5L1B, 14049 kc, is a Liberian station.
5N5—5N5AAF, 28045 kc, and 5N5AAU, 28054 kc, are in Nigeria.
9C9—This is a new prefix for Iran. 9C9WB, 14210 and 28556. 9C9TW, 28584 kc.

QSL Information

WN2KLB, 404 O'Brien Court, Wyckoff, N.J. 07481 volunteers to be QSL Manager for an African station.
HT1MG, P.O. Box 2988, Managua, Nicaragua needs a QSL Manager located in Kansas City.
AX9YR (Cocos Keeling Island)—Via VK6RU.
CE9AZ (South Shetlands)—To CE3RR.
CN8DW—c/o W6GZI.
CR5SP—Via W2GHK.
CR7IK—To W7VRO.
CW4AR—c/o CX4AR.
DK0WA—Via DK2BI.



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New high performance 2-meter transceiver

SR-C806MA

Basic Features: ■ All silicon semiconductors solid state circuitry ■ 12 crystal controlled channel capability ■ 4 channels factory installed ■ 10 watts of R.F. output power ■ Low power consumption ■ MOSFET mixer ■ Noise operated squelch circuit ■ Hi lo power switch ■ Illuminated dial ■ Self contained speaker (provisions for remote speaker included) ■ Metering of battery voltage, relative received signal strength and power output ■ Compatible with S.C.C.'s accessory items such as the SR-C12 120 1A or SR-C12 120-5 base station A.C. power supplies, the SR-CL25 25 watt power booster and the SR-C202K remote speaker.

SPECIFICATIONS

Transmitter

RF power output — .8 or 10 watts

Audio response — + 1 3 dB of 6 dB/octive pre-emphasis

Output impedance — 50 ohms nominal

Deviation — Internally adjustable to ± 10 kHz min. factory set to ± 7 kHz

Spurious and harmonic attenuation — 50 dB below the carrier power level

Freq. Range — 143 to 149 MHz 12 channels in 2 MHz spread

Supply voltage — 11 to 16VDC. 13.8VDC nominal

Current consumption — .15 amp receive standby. 2.4 amp transmit

Dimensions — 6⅞"x x 2½"h x 9⅞"d

Weight — 4½ lbs. max.

Receiver

Sensitivity — .35 or less microvolts for 20dB quieting

Squelch sensitivity — Threshold — .2 microvolts or less

Deviation acceptance — Up to ± 15 kHz deviation

Spurious and image attenuation — 50 dB below the desired signal threshold sensitivity

Adjacent channel selectivity (30 kHz channels) — 60 dB attenuation of adjacent channel

Type of receiver — Dual conversion superheterodyne

Audio output — 2 watts minimum

Audio distortion — 10% maximum at 1 watt output

$335.00

Complete with mounting bracket, microphone, and crystals for 4 channels. (Ch. 1-146.94/94, Ch.2-146.34/94, Ch.3-146.20/80, Ch.4-146.34/76).

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EP2DX–To W3HNK.
EP2FB–c/o W3EMH.
F6AEV–Via WB2QXX, 106 South Cornwall Ave., Ventnor City, N.J. 08406.
FB8WW (Crozet Island)–To W2AIW.
FP0AM–c/o W2KBE.
FR7ZO/T (Tromelin Island)–Via FR7ZO.
GC5AGA–To K4II.
HB0XSB–c/o DJ8KB, 863 Coburg, Pilgramsroth 94, Germany.
HC8AA–Via HC1RF, P.O. Box 289, Quito, Ecuador.
HH9DL (Oct. 21-25, 1970)–To W6WLH.
HI3XAM–P.O. Box 700, Santiago, Dominican Republic.
HS3ACV–c/o W8BVJ.
IT1AJ–Via VE3ACD.
IT1KDB–To VE3ACD.
JW1EE–c/o W2GHK.
KC6RK (Western Carolines)–Via WA5BON.
M1D–To I1MKN.
M1I–c/o I1BNZ.
OE1ZBW–Via W2GHK.
PJ8AR (Oct. 24-25, 1970)–To W3HNK.
PJ9AF (Oct. 24-25, 1970) c/o W3KMV.
PJ0FC (Curacao, Nov. 27-29, 1970)–Via W1FJJ, 180 Den Quarry Rd., Lynn, Ma. 01904.
TA1AM–To K4EPI.
TA1IB–NOT via W4GHV, effective immediately.
TJ1AW–c/o K4ZCP.
TY7ATF–Via W3RLY.
UP2KBC–To W3YI, 326 Schenley Hall, University of Pittsburgh, Pittsburgh, Pa. 15213.
VK2ADX–c/o K6ZDL.
VK6HD, AX6HD (ex-G3HDA)–M.E. Bazley, 32 Flora Tce., Lesmurdie, Western Australia 6076, Australia.
VP2EE (Anguilla)–Via W9ZRX.
VP2GBL–To W4YHB.
VP2KX–c/o W2MS.
VP2VY–Via W3HNK.
VP8JV (South Orkneys)–P.O. Box 137, Port Stanley, Falkland Islands.
VP9DX (Oct. 24-25, 1970)–W3HGV, 2102 Weatherton Drive, Wilmington, Del. 19810.
VS6DO–To W2GHK.
VU2REG–c/o VE7BWG.
W7UXP/Kure–Via KH6HCM.
W8IMZ/8–Bernie Welch, 6813 Winthrop Drive, Dayton, Ohio 45431.
WA4MMO/KP4–To W2GHK.
YA1PBD–c/o W2GHK.
YB3, YC3, & YD3 calls–Via P.O. Box 59, Surabaja, Indonesia.
YB0AAG–To P.O. Box 2280, Djakarta, Indonesia.
YP2HA–c/o YU2HA.
YT0M–Via YU1SRS.
YV0AI–To W2GHK.
ZD7SD–c/o WA2DWE.
ZF1AN–Via W2HAQ.
ZL4OA/A–To ZL2GX.
ZS2MI (Marion Island)–c/o ZS2PX.
3A0FJ (July 24-27, 1970) Via W2GHK.
4B1AE–To XE1AE.

4M4CDK–c/o YV Bureau.
4S7AB–Via W2CTN.
5J4BNC–To HK4BNC, Air Mail Box 3865, Medellin, Columbia.
7X2MD–c/o I1IJ.
9H1CD–Via W2LGU.
9I6XZ–To WA0ZZT.
9N1MM–c/o W3KVQ/2.
9Q5GE–Via W8WBT.
9V1PM–To GM3WRN, Colin R. McRae, Sergeant's Mess, R.A.F. Kinloss, Forres, Morayshire, Scotland.

73, John, K4IIF

WPX Contest [*from page 51*]

approval but thanks as well. We consider it the "piece de resistance," the frosting on the cake in the contest.

All areas except Africa and Oceania showed a marked increase in activity and returns this year. Most notable of course was the tremendous activity out of Brazil, followed by the USSR, Japan and the USA. The overall returns from Europe also showed a big improvement. We counted a total of 827 logs, a 40% increase over last year. That's quite a jump, with a little luck we should break 1000 in the next one.

Again we received requests that contest logs be credited for WPX awards. And once again we must remind you that all WPX applications must be made to the Awards Manager, Jerry Hagen, WA6GLD, 5031 Arroway Ave., Covina, Cal. 91722. We in turn will confirm your claimed list from your prefix check sheet, providing of course that your contest log is in order.

SM7DER wants to thank the Contest Committee and log checkers for our work in reporting the final results. "That must be the hardest part of the whole contest," observed Sten. You can say that again.

So, in the next one coming up soon, March 27-28, you can be a great service to us by scoring your log correctly and double checking it for duplicate contacts and correct multipliers. Rules will be the same as this one we have just reported, with double QSO points on 40 and 80, and the now well established rest period for single operator stations. Check the CONTEST CALENDAR in this issue. Rules in detail in next month's issue.

Work on this one was done by Bernie Welch, W8IMZ/8, now a permanent member of the Committee and yours truly. This year we were also assisted by a new member, Garry Firtick, W1EBC who is showing a keen interest in contest work. Andy Malashuk, W1GYE also managed to find time to give a hand. And what would we do without Joan of the *CQ* office staff who opens all the mail and sorts out all your inquiries and requests that should not have been included with your contest log in the first place.

That's about it for this one.

73 for now, Frank, W1WY

THESE OM'S
HAVE RECENTLY
SWITCHED TO A
SHURE 444 MIC

WB2WVF
WA2AIU
WB2ADC
WA3FXQ
W4ZCR
WB4EPS
W5BZO
W5QCP
W6EHW
W6EOG
K7EXT
WA7HRG
WA8VUP
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WA9MIF
WA0NSD
W0BNA
WA9ULU
WA9WYD

. . . notice their improvement in intelligibility and added punch?

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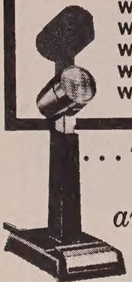

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AMATEUR ELECTRONIC SUPPLY

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SWAN 260 Cygnet 80-10m AC/DC	($50 Bonus)	$435.00
SWAN 270 Deluxe Cygnet	($50 Bonus)	525.00
SWAN 350C 80-10m Transceiver	($50 Bonus)	420.00
SWAN 500CX 80-10m – Deluxe	($50 Bonus)	565.00
SWAN 250C 6m Transceiver	($50 Bonus)	450.00
NS-1 6m Noise Silencer		36.00
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Mark 6B 6m Linear – w/tubes	($50 Bonus)	395.00
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117XC AC Supply w/spkr. in cabinet	105.00
14-117 12v DC Supply w/Cable	130.00
510X MARS Oscillator - less crystals	55.00
508 Full Coverage VFO	145.00
210 6 Meter VFO	120.00
VX-II Plug-in VOX	35.00
100kc Calibrator for 350	19.50
100kc Calibrator kit for 350C only	19.50
500kc Calibrator kit for 250 or 250C	19.50
FP-1 Phone Patch	48.00
AF-800 Audio Filter	28.00
14C 12v DC Module/cable	$ 65.00
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117X Basic 117v AC Supply ONLY	65.00
230X Basic 230v AC Supply ONLY	75.00
117 or 230vac Line Cord (specify)	8.00
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TB-2 2 Element (standard)	$ 99.00
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TB-4H 4 Element (Heavy Duty)	169.00
1040 10-40m Trap Vertical	59.95

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5' top section with kwik-on	$ 11.95
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40m coil with kwik-on	25.95
75m coil with kwik-on	27.95
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Custom Contour Bumper Mount	24.95
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Ship me the following New Equipment: ____________________

I enclose $__________ I will pay balance (if any)

☐ C O D (20% deposit) ☐ Revolving Charge Plan

Name____________________

Address____________________

City____________________

State__________ Zip__________

WPX Results

[from page 54]

ZY1ASX	"	193,990	403	190
ZW2GE	"	172,608	362	192
ZY2DCA	"	154,660	342	185
ZV1DEM	"	144,672	324	176
ZY4AYL	"	138,006	330	153
PY1DEF	"	129,404	303	173
ZZ5UG	"	117,412	325	149
PY8JL	"	113,360	398	104
ZZ1MHB	"	101,100	256	150
ZZ1HQ	"	82,878	276	114
PY3AQR	"	51,546	217	121
ZY2ELT	"	50,880	172	106
ZZ2YC	"	46,449	187	117
ZY2RZ	"	39,346	154	103
PY4CH	"	27,900	132	90
ZX7VNY	"	25,520	135	88
ZZ2PH	"	19,313	124	89
ZV7AWD	"	18,483	108	61
ZW2BJH	"	8,360	73	55
ZV2DFR	**28**	**1,010,814**	**1438**	**246**
ZX2DSE	"	868,810	1069	283
ZY3BAD	"	111,540	365	110
ZX2DVH	**21**	**550,564**	**984**	**212**
ZX1MB	**21**	**510,952**	**820**	**221**
ZV4KL	**21**	**499,618**	**706**	**254**
ZW2SD	"	378,697	656	199
ZW1TX	"	264,012	479	196
ZY1ATR	"	226,233	460	171
ZX1CHP	"	152,864	406	136
ZY1JZ	"	151,060	396	140
PY2EIR	"	126,008	299	152
ZY2DTV	"	110,432	326	116
ZW7ACC	"	90,720	260	140
ZX4AKR	"	78,755	267	105
ZY2DSQ	"	76,024	256	104
PY1AYQ	"	59,920	202	112
ZV8HX	"	42,080	206	80
PY7ASQ	"	28,670	131	94
PY2RE	"	11,118	76	51
ZV5GA	"	9,600	76	48
ZV7APS	**14**	**1,756,265**	**1709**	**361**
ZW2CAB	**14**	**600,304**	**840**	**272**
ZW7GV	**14**	**316,386**	**645**	**189**
ZZ4AP	"	280,098	470	247
ZX4RT	"	210,392	455	182
ZW9HL	"	173,082	405	182
ZW2CQT	"	167,256	364	184
ZZ2ETK	"	139,320	325	172
ZZ4ATG	"	99,540	225	180
ZZ1CK	"	98,072	279	164
ZV2BKO	"	61,362	198	126
ZV1BAR	"	46,343	187	121
ZY4KB	"	38,413	199	107
ZX2EMB	"	34,353	156	99
ZW1CFF	"	24,672	142	96
ZZ7YS	"	15,246	91	66
ZX1BOR	"	14,272	88	64
ZV7AEW	"	12,996	113	76
ZV2ATV	"	11,325	112	75
ZW5EX	"	8,645	108	65
ZW1CJL	"	6,468	76	66
ZV6BM	"	4,884	54	44
ZY2BZD	"	3,100	68	50
ZV2EGT	"	2,993	50	41
ZW1BV	"	1,680	46	40
PY2BWB	"	225	19	15
ZX2RW	"	72	14	12
PY1CCK	"	18	6	6
ZW2CMS	"	6	2	2
PY4BQO	**7**	**18,096**	**70**	**58**
ZW7AZQ	"	17,278	63	53
ZV2EWL	"	7,920	50	44
ZY2EQR	"	4	2	2
ZX2DL	**3.8**	**1,360**	**21**	**16**

Chile

CE3OE	**21**	**187,580**	**412**	**165**
XQ3ZN	**14**	**983,625**	**1181**	**305**

Colombia

HK4DF	**A**	**157,680**	**329**	**135**
HK5BWX	**14**	**21.010**	**117**	**85**

Curacao (N.W.I.)

PJ9JR	**A**	**2,972,826**	**3168**	**317**

Ecuador

HC1RF	**3.8**	**57,526**	**170**	**58**

Peru

OA4LM	**A**	**121,034**	**311**	**146**
OA8V	**3.8**	**69,252**	**138**	**87**

Suriname

PZ1AH	**21**	**274,571**	**436**	**229**

Trinidad

9Y4VV	**14**	**218,603**	**463**	**167**
9Y4KR	**7**	**48,508**	**182**	**67**

Venezuela

4M7AV	**A**	**229,090**	**421**	**155**
YV1SA	**21**	**1,020,352**	**1658**	**214**
YV5JH	**14**	**3,410**	**42**	**31**
YV1BI	**7**	**237,060**	**305**	**135**
YV5BTS	**3.8**	**402,930**	**388**	**185**

Multi-Operator Single Transmitter

NORTH AMERICA

United States

W2PV	**990,720**	**1135**	**344**
W3FDY	**323,041**	**710**	**210**
W4EAL	**508,580**	**615**	**295**
WA5SGD	**444,600**	**662**	**247**
W5PXZ	327,669	610	239
W6HX	**1,115,115**	**1412**	**255**
WB6OLR	1,000,192	1266	256
W5CWQ/6	601,880	956	205
WB6JOD	93,853	323	127
WA6BVY	71,208	214	129
K8MMM	**1,048,110**	**1161**	**322**
K8UDJ	618,485	782	287

Canada

VE8RG	**208,088**	**605**	**148**

Puerto Rico

KP4ES	**2,401,560**	**2777**	**360**

AFRICA

Angola

CR6JC	**214,720**	**422**	**176**

Cape Verde Is.

CR4BC	**2,100,526**	**2131**	**331**

ASIA

Iran

EP2FB	**614,568**	**1058**	**232**

Japan

JA0YAW	**116,432**	**301**	**152**

Ryukyu Islands

KR6HR	**1,233,136**	**1639**	**296**

Thailand

HS5ABD	**1,285.120**	**1939**	**320**
HS3ACP	735,905	1363	265

U.S.S.R.

Asiatic

UK9AAN	**3,957,212**	**3013**	**434**
UK9CAE	845,370	1223	279
UK9HAD	104,544	295	144

EUROPE

England

G3WYX	**1,768,732**	**2156**	**362**
G3SSO	1,380,925	1609	325
G3NRS	575,720	1009	296
G3WTV	473,820	772	265
G3FVA/A	222,861	520	211
G3EED	128,760	424	185
G3PY	43,860	169	129

Finland

OH4RH	**753,067**	**1088**	**273**
OH2AA	30.400	171	95

Germany

DL0WN	**1,218,750**	**1860**	**250**
DL0UE	788,456	1094	268
DL4RM	**989,340**	**1693**	**220**
DM6AO	**1,649,985**	**1969**	**317**

Hungary

HA9KOL	**141,484**	**526**	**163**

Iceland

TF2WKF	**1,429,560**	**2313**	**330**

Isle of Man

GD3TXF	**1,974,732**	**2255**	**356**

Italy

I1DFL	**61,125**	**288**	**125**

Luxembourg

DL4RM/LX	**124,312**	**338**	**164**

Malta

9H1BA	**308,096**	**768**	**232**

Norway

LA1K	**1,745,674**	**2088**	**329**

Netherlands

PA0HBO	**1,621,080**	**1692**	**360**
PA9GC	553.491	952	267

Sweden

SK6AW	**981,084**	**1230**	**331**
SK4DM	182,532	555	212
SM5AQN	88,312	280	152

Yugoslavia

YT0M	**270,756**	**741**	**254**
YU4EBL	249,264	711	216

U.S.S.R.
Club Stations

European

UK3SAB	**702,090**	**1118**	**290**
UK4HAW	260,295	624	185
UK4FAD	133,094	500	177
UK3DAA	44,388	206	137
UK3TAA	39,240	240	109
UK3WAB	36,106	239	146
UK3VAA	11,984	123	56

Estonia

UK2RAA	**675,061**	**1244**	**271**
UK2RAJ	55,800	292	124

Latvia

UK2GAA	**966,638**	**1461**	**272**

Lithuania

UK2BBB	**855,650**	**1267**	**314**
UK2BAB	594,643	1018	263
UK2PAA	10,061	102	74
UK2PAD	3,870	72	43

Ukraine

UK5EAQ	**195,570**	**595**	**218**
UK5VAE	120,696	451	188
UK5DAA	75,411	318	133

OCEANIA

Hawaii

KH6SP	**1,980,342**	**2750**	**234**

SOUTH AMERICA

Brazil

ZV3BXW	**1,463,872**	**1998**	**257**

Multi-Operator
Multi-Transmitter

NORTH AMERICA

W3SS	**479,050**	**666**	**275**
W6YRA/7	**242,080**	**623**	**160**
WA3JIH	177,684	355201	

ASIA

4Z4HF	**4,913,064**	**4488**	**362**
JA3XPO	**984,900**	**1324**	**300**

EUROPE

DL0WW	**2,225,951**	**2226**	**401**
UK6LAZ	**1,983,934**	**2369**	**391**
SM5BPJ	**417,435**	**655**	**255**
SK1AQ	238,260	516	209
LA4O	188.059	459	181

Our thanks to the following stations who submitted their logs for checking purposes:

CX1BBR, CX1JM, F6ATE, GB2SM, HA2KRB, HA4KYB, HA6NI, HK5AZA, LU4VL, OD5BZ, OH5RZ, PY1HT, PY1OK, PY1SJ, PY2DHM, PY2SO, SL7ZJ, SM2COR, SM5CCH/0, SM7DBD, SP8-1079, UA3BB, UA3FF, UA3-127204, UA4LT, UA4-09543, UA9IF, UA9-140113, UB5RR, UC2AI, UK4NAN, UK5QAU, UK6LKA, UK9UAR, UV3DN, UV3FD, UV3MM, UW9HP, VE3CEA, VE7PY, W1WY, WA9MRB, XE1AE, YV5BPG, YV5BWP, ZP4AJD, ZZ1IE, ZZ2DLC, ZZ8AAX, 3Z2BMM, 3Z5BSV.

STATION OPERATORS

Multi-Operator Single Transmitter

CR4BC & VE1ASJ. **CR6JC** & Paul. **DL4RM:** DK1BN, DK2OS, DL4GG, DL5DY, DL5DW, DL5OK. **DL4RM/LX:** DL4ER, DL8RH, LX1SL. **DL0UE:** DJ4GO, DJ0ND, DK3FZ, DL3LU, DL8LU, DL8RM. **DL0WN:** DJ3GY, DJ6MD, DJ7IK, DJ0JX, DK3DS. **DM6AO:** DM2ATD, DM2BOG, DM6MAO. **EP2FB** & EP2YL. **G3EEO:** Club Group. **G3FVA/A:** G3FNM, G3SMM, G3SMT, G3VIW, G3WFT, G3YKJ, G3YTZ, G8DMJ. **G3NRS** & G2KK, G3TZU, G8AZA. **G3PY** & G3AUB, G3NWP, G3WWX. **G3SSO:** G2HDU, G3FXA, G3PEO, G3SNN, G8KG. **G3WTV** & G3YAR. **G3WYX** & G3HTA, G3RUV, G3RUX, G3TJW. **GD3TXF** & F5QQ, GW3WVG. **HA9KOL:** Club. **HS5ABD** & XW8CS. **HS3ACP:** Group. **I1DFL:** W4NEN, WA5ZXG. **JA0YAW:** Club. **K8MMM** & K3TVP, WA8LEO, WA8VCY. **K8VCY** & K1ZND, K7NHV, WA3GBU. **KH6SP:** K5LTH, KH6BZF, KH6GQH, KH6HDH, WA5NNE, WA8IAP. **KP4ES** & KP4AST. **KR6HR** & KR6JV, KR6MD. **LA1K:** LA1EE, LA1SL, LA2KM, LA2QK, LA6VM, LA7XK, LA9DL. **OH2AA:** OH2BFF, OH2KA. **OH2RH** & OH4RF, OH4OO. **PA9GC:** ON5JM, PA0BEA, PA0JR, PA0PAN, PA0WAW. **PA0HBO** & PA0HOR, PA0SNG, PA-1555. **SK4DM:** SM4CLR, SM6CNN. **SK6AW:** SM6CJK, SM6EJA, SM6CVE, SM6CAS, SM6EJI. SM6BD. **SM5AQN:** 3 oprs. **TF2WKF** & Club group. **UK2GAA:** UQ2AO, UQ2ON, UQ2PD, UQ2PN. **UK2PAA**: UP2OE, UP2PX. **UK2PAD:** UP2BAA, UP2MC, UP2OE, UP2OX. **UK2RAA:** UR2CW, UR2DW, UR2PA. **UK2RAJ:** UR2-083700, UR2-083701. **UK4FAD:** UA4-1486, UA4-14833, UA4-148107. **UK4HAW:** UA4IQ. UA4IU. **UK5DAA:** UB5VK, UT5DL. **UK5VAE:** UB5-06634. UB5-06683, UT5IQ. **UK9ANN:** UA9BB, UA9BE, UA0BP, UV9AB.UW9AF, UW9BY. **VE8RG** & VE8YE. **W2PV** & W2CVR, WB2BMQ, WB2VJB. **W3FDY:** 3 oprs. **W4EAL** & WA4JPK, WA4PCW, WA4PFD, WA4YWM, WB4OSS. **W5CWQ/6** & WB6OYU. **W5PXC:** Club. **WA5SGD** & W5EQT, W5KTR, WA5RXT, WA5UCT. **W6HX** & WB6OLD, WB6VFJ. **WA6BVY** & WA6EJL. **WB6JOD:** K6BDK, K6WSS, W6KHS, WA6FFV, WA6HCL, WA6UAJ, WB6MVK, WB6TPU. **WB6OLR** & K6SDR. **YT0M:** 2 oprs. **YU4EBL** & YU4VFC, YU4VXW. **ZV3BWX** & ZZ3ZHJ. **9H1BA** & Club group.

Multi-Operator Multi Transmitter

DL0WW: DJ3YV, DJ4OQ, DJ6DU, DJ6NT, DJ9CE, DJ9VS, DK1AN, DK6FF, DK6CK, DL2UU, DL3ZA, DL6NK. **JA3XPO:** JA3AA, JA3CHQ, JA3KGF, JA3UI, JA3USA. **LA4O:** LA2NL and group. **SK1AQ** & SM1CJV, SM1CXE. **SM5BPJ** & SM5BLA, SM5SB. **UK6LAZ:** Alex, Val, Vic, Vit, Vlad, Yuri. **WA3JIH** & WA3MQJ. **W3SS** & K3JLK, WA3MPK. **W6YRA/7:** K6SE, WA7DUG. **4Z4HF:** K2IXP, 4X4FV, 4X4GV, 4X4NJ.

The DRAKE 4 LINE

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Ray Grenier, K9KHW, Mail Order Sales Manager at
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Remember, too! When trading with AMATEUR ELECTRONIC SUPPLY you can use our STAY-ON-THE-AIR PLAN, which means you can keep your trade-ins until your new equipment arrives. – Lose no operating time! CU on the air!"

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Ham Shop

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SAMCO QSLs-"Sampler Instruction Kit" 25 cents Box 203, Wynantskill, N. Y. 12198.

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HEATH SB-100, SB-300, SB-600, Halli SX-71 rcvr Mosley TR-Tribander. Reasonable. C. Wyman---, 4453 Pinzon, Palos Verdes Estates, Calif. 90174.

The 20th Anniversary DAYTON HAMVENTION will be held on April 24, 1971 at Wampler's Dayton Harra Arena. Technical sessions, exhibits, hidden transmitter hunt and an interesting program for the XYL. For info, write Dayton Hamvention, Dept. C, Box 44, Dayton, Ohio. 45401.

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COLLINS: 32V2 w/manual 80-10 Xmtr, $130. Receiver Hallicrafters SX-99 General Coverage, $79, Model 15 TT w/case and keyboard, $50. Write or call: L. Verhage, 1129 Temple Grand Rapids, Michigan. (616) 241-1387.

HAMS — GENTLEMAN FARMERS: Selling my 97 acre farm with Beautiful OLD STONE COLONIAL HOME, 4 bedrooms, 1 1/2 bath, living rm F/P, family room F/P, dining rm F/P, mod. kitchen. 4 car garage, stone bank barn, Old shade, 2 streams, high with view. $275,000. Write for brochure WA-3DSI, Chris, Elverson, Penna. 19520.

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1971 TEST-ANSWERS for FCC First and Second Class License. -plus- "Self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. COMMAND, Box 26348-H, San Francisco, Ca. 94126.

HAMMARLUND HQ-170C, MINT CONDITION. MAKE OFFER. W2EZF, 715 Oak Hill Ave., Endicott, New York. 13760.

SELL: Knight T-150, $50; Lafayette He35A6m transceiver, $35; Lafayette He74 80-6m VFO, $25; Eico 730, $20. WA2UKI, 8337 256th St., Floral Park, New York. Phone (212) 343-5372.

TRANSISTOR CODE PRACTICE OSCILLATOR, Delux Key and Phones, $10.00 plus postage. W5DZA, 826 Ranchitos, Santa Fe, New Mexico. 87501.

DRAKE TR3, AC3, set spare tubes, $350. MM2 Scope plus RM50 and RM455 Receiver Adapters, $100. Heath HA-10, 1 KW Linear, $150. Norman Webster, 19545 Ingomar, Reseda, Calif. 91335.

KNOW your frequency. Lampkin meters, 105B frequency, 111 PPM, 205B modulation. $800 value only $600. All or separate. K8ILR, RR 1, Box 29-A, Suttons Bay, Michigan. 49682.

SACRIFICE TS-186D Frequency Meter 100-10-10,000 Mhz, AC pwr, also use as sig source, calibration, $65.00; APN-9 160 meter receiver, scope, $25.00; 20A SSB 160-10 w/deluxe VFO, $85.00. W4API, Box 4095, Arlington, Virginia. 22204.

FOR SALE: TYMETER 24 hour clock, chuckaf is mtr. YAGI Super-Pro Receiver. List on SASE. WB2DCH, Salt Point, N. Y. 12578.

HQ170C - excellent Receiver, $150.00, plus shipping. Need: Collins cw filter for 75A4 type F455J-05 500 cycles. WA2YPD. Phone: (201) 327-2051.

Sixer, $25.00. Rg9, 214 11.4-65A with socket, $4. Xfmr 6v-17A. 770v-350A. All brand new. Metal detector, $125.00. WA2FFZ, 186 West, Pitman, New Jersey.

SWAN-350, like new w/117XC, Xtal cal, opp. SB and new spare finals. $350. K5SGH, (713) 498-5475. 11223 Sandstone, Houston, Tx. 77072.

FOR SALE: HQ 170c mint, no scratches. $150. Hy-Gain DB62 (2 and 6) meter ant. with one feed line. New, never used. Will ship your Qth. $20. Fred Colella, 105-18 131st Street, Richmond Hill, New York. 11419.

SSB: HALLICRAFTERS SR-400 w/pwr/spkr, dust cover, mike. Best offer over $550.00. WB2DCH, Salt Point, New York. 12578.

WANTED: SQUIRE-SANDERS SPKR (SS-IRS). K8NGV. T. Hoitenga, 26496 W. Six Mile, Detroit, Michigan. 48240.

WANTED: VIKING II, cheap to strip for parts. Or L. Volt Trans. for Viking II. G. Zurbuchen, 13631 South Elm St., Orland Pk., Il. 60462.

RELAY WE 276A MERC tested for RTTY, 90 Ohm coil. $1.50 pp. R. H. Sanborn, 8800 West Clovernook Ct., Milwaukee, Wi. 53229.

GOT MY GEN., MUST SELL PERFECT DRAKE 2B with 2AC so I can move up to Gen. Rig; hate to part with. Best offer over $150.00. WB4PHW, Box 410, Crossville, Tn. 38555.

WANTED: CE 200V, 50' Crankup aluminum tower W4LCR, J. W. Knoche, 1830 Kings Avenue, Jacksonville, Florida. 32207.

SELL: GALAXY V MK II, AC400/PS, Cal, spkr, manual, $325.00, postpaid. G. N. Westfall, KG-6ASP, 4 Ragsdale St., Nimitz Hill, FPO San Francisco, California. 96630.

FOR SALE: Hammarlund HQ-215, 15 hrs. use, ret. $529. Heath DX-60B xmtr & matching HG10 VFO. Make offer to: WA3NZE, 1009 Old Ford Rd., Huntingdon Valley, Pa. 19006.

SELL: AN/URA6 TTYP Converters- extra parts-manual- unit needs minor work, $125.00. Northern Radio Model 107 A.F.S.K. tu., with 2" scope, needs a few new tubes, $40.00. WA4WIA; 1645 Dobbs Lane, Birmingham, Ala. 35216.

FOR SALE: 40 meter CW mobile xmtr with pwr supply 50W, $25.00. W6BLZ, 528 Colima St., La Jolla, California. 92037.

FOR SALE: Webster Bandspanner mobile antenna. Excellent condition, 80 — 10M bands. First $20 takes it. Elliot Levin, WA2BPL, 415 Sheffield Rd., Cherry Hill, New Jersey. 08034.

WANTED: 2.1 KC Filter for 75A-4; also 2-4CX-250-B's needed. W0DZZ, Blue Earth, Minn. 56013.

WANTED: 500 Cycle Mech. Filter for 75A4. W8HBQ, Box G., Moundsville, W. Va. 26041.

HEATH MOHAWK RX-1 rcvr., vy gud. cond., $145; Gonset G-76 Xcvr as is, $70. Will ship anywhere. R. Guard, K4EPI, 750 Lily Flagg Rd., Huntsville, Alabama. 35802.

FOR SALE: Drake 2-C Receiver & 2-CQ Q-Multiplier-Speaker combination, $195.00. H. P. Keeley, W9CRV, RR2, Box. 110, Long Grove, Il. 60047.

BRAND NEW SB301 - 3 mos. old, $265.00. Ranger I, Good Condx., $75.00. Ed Hathaway, 4803 Russell St., Richmond, Va. 23222.

WANTED: Telrex Tri-Band Beam. Give condition and price in first letter. I pay shipping. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, Ma. 01056.

TRADE (Two) SX-117's and (One) HT-44 w/ACPS; for SR-400 w/ACPS; or one SX-117 for SR-160. W5RKT, 901A Spring Valley Plaza, Richardson, Texas. 75080.

SELL: Best offer for Harvey Wells TBS-50D, matching VFO & pwr. supply, SX-42 with SP44, NC-125 with spkr. All with manuals. All need minor work. R. J. Pinkerton, 2500 O'Neal Circle, B'ham, Alabama. 35226.

FOR SALE: Gonset II, 12V.DC-117 VAC with Gonset V.F.O. (extra stage of audio included). Cables, microphone, xtals, ant., excit condx! Best offer. W2ASI, 15 Kensington Oval, New Rochelle, N. Y. 10805. (914) NE 3-7077.

MODEL 14 TD complete, less motor, $10.00, plus postage. Goodman, 5826 S. Western, Chicago, Illinois. 60636.

WANTED: Inexpensive sensitive double-conversion receiver to use for overseas patches with family. Mike Swink, HT1MG, c/o 9516 B West 87th St., Overland Pk., Kansas. 66212.

CAPACITY/RESISTANCE BRIDGE, Navy Type CLB-60007, Good condx. with manual. $30.- W4JGO, 643 Diamond Rd., Salem, Va. 24153.

WANTED: A direct current, 5 to 10 HP motor; vintage immaterial. Cash in advance and freight COD. Geo. Clark, W6GAW, 1741 La Coronilla Dr., Santa Barbara, Calif. 93105.

HEATH SB-310 RCVR-Mint! Deluxe crystals, 13-15 modification, also 15M Novice-Manuals, $250. Bill, WN9DVV, 335 N. Elmwood Lane, Palatine, Illinois. (312) 359-3228.

HAMMARLUND HQ170C rcvr, 160-6 mtrs. Heath DX60B CW & AM xmtr. Best offer. WA1MCY, 53 Old Amesbury Line Rd., Haverhill, Mass. 01830. Telephone: (617) 372-2408.

TOROIDS, 88 Mh, uncased, 5/$1.50 PP 48, E. W. Evans, K4OEN, 220 Mimosa Lane, Paducah, Kentucky. 42001.

SBE-34 w/mike, excellent condx. $210.00. WA2-AMU, Jim Glennon, 610 B'way, Kingston, New York. 12401.

SELL: Gonset 76 with H.B. — A.C. Power Supply, $110.00. D.C. Power Supply, $60.00. F.O.B., Ingram, J. J. Crowl POB 74 Ingram, Tex. 78025.

FOR SALE: NC-300 receiver, excellent condition, $130.00. Also Eico 753 Transceiver with power supply. Make offer. Lewis Ransom, Junction, Texas. 76849.

SWAP: Parks 6 mtr. converter (IF-28-32 mc)for a 'mint' Turner and 2 mike. Jim Gysan, 53 Lothrop Street, Beverly, Mass. 01915.

MODEL 14 KSR, complete, and in working order. $25.00. Goodman, 5826 S. Western, Chicago, Illinois. 60636.

WATERS Compreamp 359. Mint; unused. Orig. box and instr. sheet. $15 or offer. Felstead, KH6CU, 1777 Ala Moana, Honolulu, Hi. 96815.

BC-610 Xmtr with speech amp, junction box, rectifier, coils, tuners, cables. $200.00, Silbert White, Sulphur Springs, N. Y. 12787.

FOR SALE: HQ-110 Receiver (H.F. plus V.H.F.) $95.00. DX-100B XMTR, $75. Both in good condition. Prices firm, pick up only at 3904 San Juan Street, Tampa, Fla. Ph. 813-837-4155.

FOR SALE: Hallicrafters 6 meter transmitter/receiver, Model SR-46 with VFO model HA-26, all for $125.00. F.O.B. N. Y. C. This VFO in good condition. Sig Grabel, WB2GFB, 40 Argyle Rd., Brooklyn, New York. 11218.

SELL: UNUSED TUBES. 829B, $4.00, 4X150A $5.00, 4-65A $6.00, Following $10.00 each. 4CX-250B,4-125A,5894,5-125B,100TH. G. Samkofsky, 201 Eastern Parkway, Brooklyn, N. Y. 11238.

SELL: TR-3, $325; SB-200, spare final, $195; NCL-2000, $350. K1VTM (1-203-848-3452), Ronald Nevers, 2438 Stanley St., New Britain, Ct. 06053.

COLLINS 75S-3B number 16734, $400. Looking for 2K2, 2K3, or 30S1 and for ham-band crystals. J. M. Hoffer, W1DL, 24 Cherry Road, Framingham, Mass. 01701. Phone: (617) 872-5084.

WANTED: Heath SB-610 Signal monitor, also modern tube tester mutaul conductance type. D. B. Whittemore, W2CUZ, 36 Masterton Rd., Bronxville, N. Y. 10708. Phone: (914) 337-1059.

UNCASED TY-79 DC/DC xformers 6" leads, 2/$10 postpaid. R. Porrazzo, 2014 Linda Vista, W. Covina, California. 91791. K6CQD.

WHAT? You haven't written to Mr. Nixon or your congressman yet? Write now and tell them to protect and encourage A. R. WA1GFJ, 160 Elm, No. Haven, Connecticut. 06473.

FOR SALE: Eico Model 625 Tube Tester, $20. Realistic TR Tape Recorder, $40.00. Northern 4A-105 FSK, $80.00. BC779B Super Pro w/AC, $85. Viking 6N2 for $85.00. Mr. J. H. Ashley, W4OSC, Box 254, Ware Shoals, S. C. 29692.

FOR SALE: Mint SB-220, $375.00, CN144W, w/pwr and PV preamp, $40.00. Will take SB200 in trade for 220. WA8CKT, Caro, Mi. 48723.

FOR SALE: RCA WR64A Color Bar Gen. -$85, cert. ck. W0MDM, M. S. Breyfogle, 18 No. 7th St., Estherville, Iowa. 51334.

SELL: Motorola model PA8032 FM exciter/manuals designed for 25-44 mhz 50 watts. $15 ppd. Sever, 612 Lindy Ln., North Canton, Oh. 44720.

CHICAGO AREA AMATEURS Charter Jet Flight to SAROC January 7-10, 1971. See Display Advertisement or write for details. SAROC, Box 73, Boulder City, Nevada. 89005.

SELL: Johnson Courier 500W Linear, Globe Champion 175W, Hammarlund H.Q. 140X, with Q-Multiplier & Speaker. W3GEB, 4640 York Rd., Balto., Maryland. 21212.

WANTED: Schematic and/or operating manual for TBA-11 NAVY 1 KW, C.W. Transmitter or photostats of same. Will pay cash to purchase or borrow. C. L. Pennington, 800 First St., Macon, Ga. 31201.

COLLEGE SALE: Link Radio 30-50 mc Xtal, Rcvr, (F.M.) w/spkr, Head and 6 VDC supply, $5. Hallicrafters S-120 Gen. cov. $45. Both perfect shape. WA1JQT, 99 Fitchburg Rd., Townsend, Mass. 01469.

HAVE 120 crank-up towers, new, complete with anchor rods, guy wires, and plate. Will trade for transmitter and power supply A.C. James T. Lundy, Box 26, Deming, N. M. 88030.

SAROC Flamingo Hotel Convention Center, Las Vegas, Nevada. Choice Flamingo Hotel Late or Dinner Show or Desert Inn Late Show. January 7-10, 1971. See brochure for details.

PAPER CAPACITORS: What do you need? K3DTL, Art Prutzman, 31 Maplewood, Dallas, Pa. 18612.

WORKED SOUTH AMERICA CERTIFICATE: Work all 13 countries. Send $1 and confirmation to: HC1TH. Box 583, Quito, Ecuador, S. America.

YAESU FLDX—2000 LINEAR. Mint. $225. FTDX—400 TRANSCEIVER, $450 absolutely mint. K4EPI, Box 1092, Huntsville, Alabama. 35807.

PANADAPTOR RECEIVER SCOPE ARR-533/8A-Gov't. cost $530.00. Limited supply at only $25.00 each, boxed. W5QJT, 4215 Darwood Drive, El Paso, Texas. 79902.

DRAKE T4XB-R4B-MS4-AC4-extra crystals, WWV-160-CB, perfect, near new, always TLC, might split T4XB-AC4; R4B-MS4; cost $1091.95. Sell package for $800. W0RJZ, Creston, Iowa. 50801.

JAPANESE HAM GEAR catalog. $2.00. Roland L. Guard, Jr., K4EPI, Box 99, Lacey's Spring, Alabama. 35754.

CLEANING OUT HAMSHACK. Stamp for list. Ron Guard, K4EPI, Box 1092, Huntsville, Alabama. 35807.

1896-1922 WIRELESS GEAR, WANTED FOR CASH OR TRADE. Dick Sepic, 1945 E. Orangegrove Blvd., Pasadena, California. 91104.

RUBBER ADDRESS STAMPS, $2.00; Signature: $3.50. Free Catalog. JACKSON'S, Box 443-F, Franklin Park, Illinois. 60131.

LAMPKIN MOD. METER, QUAD SCALE, $200; MOTOROLA T43GGV, $100; GE CMC-60B4-H, $175; Both Hi-Band and Exc. Hatfield, Box 607, Dobson, N. C. 27017. (919) 386-8562.

POSTAL CHESS: American Postal Chess League, Box 1022, Greeley, Colorado. 80631.

QSL MANAGER. Will volunteer my services. W7HKI, D. G. Larry Larison, Traveler's Lodge, Edmonds, Washington. 98020.

HEATHKITS WIRED 15% of cost. Price reference on request. S.A.S.E., P. O. Box 6144, Linglestown, Pennsylvania. 17112.

FOR SALE: Hammarlund SP-400 with Collins mechanical filter and NICE HB SSB Transmitter; ideal for experimenter. $100.00 each. J. Brink, POB 3734, Fayetteville, North Carolina. 28305.

NOVICES: Need help for general ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information; AMATEUR LICENSE, Box 6015, Norfolk, Virginia. 23508.

LIQUIDATION forces sale of large quantities of both 88 AND 44 Mhy torroids. Price now $1.50/5, postpaid. ELLIOTT BUCHANAN AND ASSOC., INC., P. O. Box 2145, Walnut Creek, Calif. 94595.

SELL: Mechanical filters. 455 Khz. 2.1 Khz $18.95. 300 Hz $22.95. J.A.F., 314 South 13th Ave., Yakima, Washington. 98902.

10A, QT-1, VFO SSB Exciter Combo. All coils. Gud cdx. $45. T. Hoitenga, 26496 W. Six Mile, Detroit, Mich. 48240.

FOR SALE: Clegg Intercepter Receiver. 2 yrs. old, excellent condition. $225. Ed Wagner, 6307 E. Gate Rd., Monona, Wis. 53716.

FOR SALE: Mint Collins KWM-2 w/AC-DC, $750. Like new DX100 AM-CW Transmitter, $65.00. Call: write: WA3HMQ, (717) 761-1107.

FOR SALE: Swan 250 and 117 XC power supply. First Post Office Money Order for $300.00. Willie N. Love, K5MFA, Box 411 Atlanta, Tx. 75551.

TRADE FOR SIDEBAND TRANSCEIVER OR SELL: HQ-170, $149. HR-10B, $48. WA0ZUP, 219 W. Madison, Iola, Ks. 66749.

SELL: 4—125A, $10.00; 100KC xtal, new, $3; unused 4—65A, $5.00. Add shipping. Samkofsky, 201 Eastern Pkwy., Brooklyn, N. Y. 11238.

WANTED: Johnson Thunderbolt Meter 0-750 ma D.C. W5CDJ, Richard P. Boyd, Jr., Rt. 2, Box 5X, Jonesville, La. 71343.

WANTED: Instruction book for Hammarlund 140X, Alberto, XE1NE, P. O. Box 2807, Mexico City 1, Mexico.

WANTED: 1966 thru 1970 'Radio Electronics' magazines. Will pay $1 per year and postage. Joe Wegner, Jr., POB 262, Glendale, Calif. 91209.

WANTED: To buy or borrow and photocopy, MANUAL and SCHEMATIC for Knight-Kit Monitor III two-band VHF monitor receiver kit. Manual missing from my kit and Knight says is no longer available. Write: Theodore J. Leonberger, K3-RCI, RD 2, Rockwood, Penna. 15557.

P/S GALAXY V never used $40, Amphenol type 259A connectors 6-$2, Microamm $3. W9DI, 22 S. Clay Street, Hinsdale, Illinois. 60521.

WANTED: Old Raytheon type BH tube and 1922—1924 Radio News. W7KE, 1109 South 2nd, Hamilton, Mt. 59840.

SELL: A-1 35mm cameras. Canon Canonette, F:1.9 lens, automatic electronic diaphragm, $68. German Iloca, F:2.8 lens, with case, $38. W2HSM, Syracuse, New York. 13210.

SELL: 14 & 19 covers; others TTY parts. SASE for list. D. L. Hartley, Rt. 1, Box 247, Yorkville, Illinois. 60560.

BERKELEY COUNTER, 1 Mhz, 7 digits. Excellent. $200.00. Heath Sweep Gen. Like new with manual, $39. R. Mendelson, W2OKO, 27 Somerset Pl., Murray Hill, N. J. 07974.

HUNTER 2000B 2KW Linear for $240.00. Reconditioned TR-4 Rotator for $35.00. Bob, W0-YVA/4, 4423 N. 17th Street, Arl., Va. 22207. Phone: 524-2398.

FOR SALE: HW-100 w/AC power supply; $250. Exc. condition. WB8EPE, 607 Shake Drive, Medina, Ohio. 44256. Call: (216) 723-5391.

SX42, B.C. to 108 mhz, AM, FM, SSB, with matching spkr. in new cond. $65.00. WB2FJO, A. Schur, 1878 Schenectady Ave., Brooklyn, N. Y. 11234.

LINEAR BUILDERS: 30 Amp Filament Chokes for Grounded Grid Linear Amplifiers. Brand new. Not surplus. $5.00 each. Postpaid USA. Vonn R. Murrell, K4HHA, 712 Rich Rd., Newport, Tennessee. 37821.

NEED EXTRAS: Large selection of extras ... every order includes: USA — CANADA - NUMBER PREFIXES — P. R. — KOREA — GUAM — MEXICO, etc. 500 for $9.00; 1,000 for $11.50; 2,000 for $22.00. Send M. O. to John P. McDonald, Route 1, Elk City, Okla. 73644.

ARC at LINCOLN Hi needs any condition SSB trans or any SB equipment. Would be very much appreciated; also any RTTY gear, any cond, as Phil WA6AZE a 15 yr old student has brain power to fix any electronic equipment that is donated to club. Please contact Kenny, K6OPG, 455 41st Avenue, San Francisco, Calif. 94121. 386-6543 LL.

FOR SALE: 100V Transmitter less than 10 hours operating time on it. Mint, $395.00. John Geczi, W8OOP, 12901 Forest Avenue, Cleveland, Ohio. 44120.

HALLICRAFTERS S-76, SR75, SP-44, EICO 460, 432, ARC-5's. Make offer. T. Gosman, 143 Roxton Road, Plainview, N. Y. 11803.

EICO 753 AC P/S mint condx $150 or trade on SX-146 Recvr. W6GGT, 1925 Bidwell Way, Sacramento, California. 95818.

NEED SCHEMATIC or copy of POLY COMM. 62, will pay cost. M. Longworth, WA3OSR, 3631 Dudley Avenue, Balto., Md. 21213.

DR-30 RECEIVER in excellent shape. Will sell for best offer or swap for Collins receiver. W. Martin, Box 1304, Hq Fifth Air Force. APO San Francisco, California. 96525.

WANTED: Collins S-Line cabinet. Must be in like new condition. Mike Ludkiewicz, 143 Richmond Road, Ludlow, Mass. 01056.

SELL: Popular Electronics Magazines. February, 1965, until present. March-April, 1965 missing. Best offer. No sell singles. W0RJZ, Box 466, Creston, Iowa. 50801.

SALE: 2KZ, $525. TR4, AC4, MS4, $500. RV4, $70. R4B, $320. All: $1,300.00. Ray, W6KFM, (714) 653-5442, 25351 Filaree, Sunnymead, California. 90509.

SX-117, HT-44w/ACPS, mint and matched, $399. Or SX-117 separately, $179. All FOB, Dallas. W5RKT, 901A Spring Valley Plaza, Richardson, Texas.

WANTED: Bird Wattmeter Elements for Model 43. Collins PM-2. Gonset Comm IV - 2 meters. Send description & best price. C. Simmons, Box 575, Atwater, Calif. 95301.

FOR SALE: Mint SB200, almost new. Tubes, $195. No trades. Mike Morrisey, W4LXA, 752 High Street, Harrodsburg, Ky. 40330.

BEST OFFER: SWAN 250C, mint, noise blanker, Vox, 117XC Supply & TV2B, Package deal only. K3YMN-2185 Sampson Street, Pgh., Pa. 15235.

WANTED: Low frequency receiver 10 Khz to 200 or 500 Khz. Must be good condition, with instruction book. W7DNQ, 4631 East 8th Street, Tucson, Arizona. 85711.

MAGAZINES FOR SALE: Send list of Ham (only) issues needed, money (10 cents each) and postage costs to Lockheed Amateur Radio Club, 2814 Empire Avenue, Burbank, Calif. 91504. Your issues (and any refund due) will be sent promptly.

WANTED: Lab Test Equipment, Guns, Coins, etc. Have large inventory of parts, IC's, Teletype parts, Tools, Etc. No lists. What do you need? WB4HBD, R. H. Williams, 8521 Middlebrook Pk., Knoxville, Tennessee. 37921.

SSB: HT-46, $239. SX-146 wid AM, CW filter and XTAL CAL. $199. Both like new. P. J. Scrafinas, 925 Coleridge Rd., Balto., Md. 21229.

EARPHONES, F.O.B.: 1 pr. Baldwins, $7.50; 1 pr. Brandes, $3.50; 1 pr. Coryphone, $3.50; 1 pr. WE528 $3.50; 1 pr. WE509W, $3.50; Douglas, 2254 Pepper, Concord, California. 94520.

KWM2 — H.B. AC. Trade for R4B — T4XB., etc. H.B. 3—1000Z Linear, $250.00. No A.C. Sply. WA4LXX, 251 Collier Avenue, Nashville, Tennessee. 37211.

FOR SALE: QRP Rig Int Xtal OX and PAX w/ xtals for 7015 and 7142 — $10. Morrow CM-1 BC rcvr, shielded; use as tuned i.f. for conv. — $8. W2CVW, 13 Robt. Cir., S. Amboy, N. J. 08879.

MINT NCX5 w/AC Pwr-Spkr Cabinet, $375. NCL 2000, $340. All 3 for $690. H. L. Greene, 211 Circuit, Hanover, Ma. 02339. (617) 878-1256.

FOR SALE: Pair of RCA CW-5B, 960 Mc. crystal controlled receivers. Each $50.00, rack mounting, W6DOU, 3154 Stony Point Road, Santa Rosa, California. 95401.

FOR SALE: Eico 753 with 751 AC Supply, mint, $150. Jim Carlin, 707 Ortega Rd., Nashville, Tennessee. 37214.

SELL: BC-312-N, $28; Good DX100, $50. You pick up. Box 215, Ironia, N. J. 07845. Phone: (201) 584-3384.

HALLICRAFTERS SR-42A: 2M AM Xcvr with mobile power supply cord (excellent condition), 4 xtals, manual; $125.00. WB0BBC, Paul Passman, 8221 Tomahawk Rd., Prairie Village, Ks. 66208.

SELL: All transistor 5 watt mobile 5 channel CB rig. $50 pp; QST 65-69, CQ 68-69 all 7 yrs., $20 pp. Box 895, Greeley, Colorado. 80631.

WANTED: KWM-2 and all trimmings, mint. Cash or trade new GE Master equipment. J. Nehring, W0ENJ, 3623 Stebner Rd., Duluth, Minn.

WANTED: Part F-455J-60, 6KC Filter for 75A4. Will trade Model 15 TTY, PS and Table. K1IGF, 83 Lovers Ln., E. Lyme, Ct. 06333.

SELL: Valiant I, Johnson KW matchbox/SWR, Johnson 6N2/6n2 VFO. All mint condx, $100 apiece with manuals. Will ship. Sever, 612 Lindy, N. Canton, Ohio. 44720.

BC221, book & P.S., $35; B & W $35; Knight sweep, $50; Heath Impedance bridge, $50; B &K Analyst number 1076, $150. WA6YTR, Box 241, Calimesa, Calif. 92320.

SELL: Most Ranges Panel Meters only $2 each, plus shipping. G. Samkofsky, 201 Eastern Pkwy., Brooklyn, N. Y. 11238.

SELL: Factory built Eico 753 with 751 P.S. Excellent condx. $170. WA0NUX, P. O. Box 70, Springfield, S. D. 57062.

DX STATIONS: W2KF will serve as your statewide QSL Mgr., and provide QSL cards. Write: W2KF for details. 309 Cherry Hill Blvd., Cherry Hill, N. J. 08034.

URGENTLY NEEDED: Construction manual for DX-100, operating manual for DB-23. E. Sjolander, Jr., Box 262, Ashland, Wi. 54806.

WILLTRADE: 572 Tube for572A. Need for final. Sell Motorola 30D complete with manual; also CE "A" slicer. Make offer. W9GBS, 1421 Maple, Evanston, Il. 60201.

FOR SALE: Eico 753; 3 band xcvr, 751 AC supply. Excellent condx. Sell $125. W0RJZ, Box 466, Creston, Ia. 50801.

WANTED: Calls & addresses of world's pharmacists who are licensed radio amateurs or SWL's. A new club for same being formed. Write G3WGW. C. Evans, 3212 Mesa Verde Rd., Bonita, Calif. 92002.

SALE: Tube manuals — RC12 and others. Write for list. Lewis C. Ernst, 314 South 5th Ave., Ann Arbor, Mi. 48108.

FOR SALE: Swan 14X D.C. Power Supply Module, $40. WA7GDZ, 19155 Renee Ave., Yuma, Ariz. 85364.

SELL: Weston Mod. no. 1 D. C. Ammeter, 0-0.6 and 0-1.8 amps. In leather case. L. A. Stapp, 2903 Ash, Hays, Ks. 67601. W0PHY.

Cleaning house: 75A4, KWS1, Scope, Panadaptor, BC221, SASE. I. I. Tryon, 1500 Tretter Dr., Pittsburgh, Penna. 15227.

WANTED: STEREO TURNTABLE, Garaard, Dual, BSR, what have you? Eugene Gascho, RR 2, Pigeon, Mi. 48755.

MAKE OFFER for 32S-2, 75S-3, C.E. 100V, C.E. 600L (160-10), GSB201 MkIII. WA5RTG, Box 486, Siloam Springs, Ark. 72761.

WANTED: Good used SSB/CW xmtr to drive linear. 80-10m, VFO, VOX desired. L. Heyl, Box 937, Wiley Hall, W. Lafayette, Indiana. 47906.

SELL: Galaxy V new P/S, $40.50, 200, 500, 1000 Microammeters, $3 each. K22 Rotator $8, new 259A 5/$2. Epiphone 100W ampl., rev. etcs., FOB W9DI, W. R. Cottrell, 22 S. Clay St., Hinsdale, Il.

SALE: Galaxy DAC-35 console (SWR, Dig. Clock, patch & Spkr)—$57.50. F. Strickhausen, 715 Tyler, Apt. 36, Topeka, Ks. 66603.

QST Back Issues 1941-1970 Complete plus 170 extra copies to 1929. 530 issues. Trade for camera equipment or guns. W5KHL, San Antonio, Texas.

WANTED: Telex 40 and 75 inverted V antennas, Heath Monitor Scope - Give price & condx your letter. Geo. Earl, Box 366, Ridgeway, Ontario.

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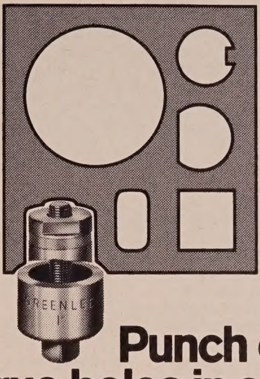

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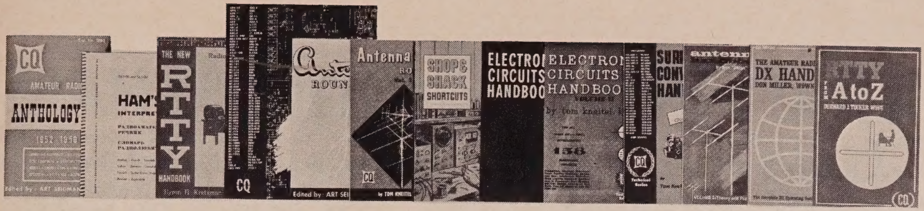

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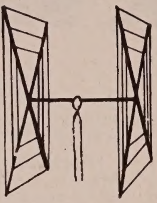
Worked 42 countries in two weeks with my Gotham Quad and only 75 watts... W3



CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16′ square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10′ long x 1¼″ O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.
Radiating Elements: Steel wire, tempered and plated, .064″ diameter.
X Frameworks: Each framework consists of two 12′ sections of 1″ OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞″ tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.
Radiator Terminals: Cinch-Jones two-terminal fittings.
Feedline (not furnished); 52 ohm coaxial cable

Now check these startling prices—note that they are *much lower* than even the bamboo-type:

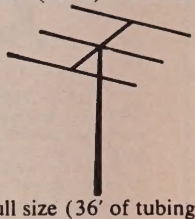
10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

GOTHAM
1805 Purdy, Dept. CQ,
Miami Beach, Fla. 33139

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36′ of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞″ and 1″ alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
3 EL 20	27	7 EL 10	34*
4 EL 20	34*	4 EL 6	20
2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
4 EL 15	27*	***20' Boom**	
5 EL 15	30*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts! *FLASH!* Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK, OZ4H, and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

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Unsnap the Module and it's instantly a FIXED Supply!

Direct plug-in to any Duo-Bander for 300 watts PEP...field adaptable to most other rigs in the 200-300 watt class. Delivers 700 VDC @ 430 MA. peak; 325 VDC @ 150 MA.; bias—120 VDC @ 20 MA.; filaments 12 VAC @ 5 A. All cables supplied for 120 VAC (60Hz) and 14 VDC (neg. ground).

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And we've added some extra features you won't find in any competitive VOM, at any price... features designed to make your work easier, help you get the job done faster.

For example: RCA WV-510A operates from batteries or AC. Remove the detachable AC line cord while you're taking a measurement and the batteries take over immediately without a flicker of the pointer. And you'll get maximum life from the batteries because they're always on trickle charge during AC operation. Stability? Switch from range to range and watch a whole series of measurements without constantly zero-adjusting the meter.

Some statistics:

Current:
  0.01 milliampere to 1.5 amperes in 8 ranges.

Resistance:
  0.02 ohm to 1000 megohms in 7 ranges.

DC Volts:
  0.01 volt to 500 volts in 8 ranges.

AC Volts:
  0.2 to 1500 rms AC volts in 7 ranges plus peak-to-peak voltages of complex waveforms.
  21 megohm resistance on all DC ranges.

And it's only \$128,† complete with DC/AC ohms probe and flexible shielded input cable with BNC connector, and removable AC line cord.
Some statistics! For complete details, contact your local RCA Distributor.

RCA|Electronic Components|Harrison, N. J. 07029